Some few Opinions of the Press on the Previous Editions of

The Printers' Handbook

Of Trade Recipes, Hints, and Suggestions relating to Letterpress and Lithographic Printing, Linotype, Bookbinding, Stationery, Process Work, etc. By Chas. T. Jacobi. With many useful Tables and an Index. Third Edition, Crown 8vo, 5s. net.

Athenæum.—"It is a purely technical work, giving hints and receipts, and doing for a printer what a cookery book ought to do for a cook. There is also much in the volume that will be useful [illegible]. The directions are clearly and briefly expre[illegible] inserted, and an index makes the volume easy of reference.

English Mechanic.—"The book contains a good deal of information that will be of use to printers and others engaged in allied branches."

Effective Advertiser.—"This book is what every master should keep on his desk, and every journeyman and apprentice be acquainted with. . . . Mr. Jacobi has rescued the fugitive paragraphs which have appeared from time to time in the trad[illegible] whether the printer wishes to find out the sizes of paper, the [illegible] type, the treatment of ink, or the best way to cast rollers, [illegible] seeks in this Handbook."

Press News.—"The result of a great deal of labour and patient research, for there are in its pages several hundred recipes and other interesting matter."

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Paper Record.—"The author seems to have forgotten no useful thing in any of the departments."

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Publishers' Circular.—"It contains much useful information that is likely to be of assistance to printers, bookbinders, and others connected with the book trade, and should claim a place in the library of every large printing house."

THE PRINTERS' HANDBOOK

THE

PRINTERS' HANDBOOK

OF TRADE RECIPES, HINTS, AND SUGGESTIONS RELATING TO LETTERPRESS AND LITHOGRAPHIC PRINTING, BOOKBINDING STATIONERY, PROCESS WORK, ETC.

COMPILED BY

CHARLES THOMAS JACOBI

MANAGING PARTNER OF THE CHISWICK PRESS
EXAMINER IN TYPOGRAPHY TO THE CITY AND
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THIRD EDITION
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PREFACE TO THE THIRD EDITION

THE prefaces to the earlier editions, now appended, will sufficiently explain the objects claimed for this work, and in issuing this new volume it should be stated that some portion of the last edition has been sacrificed in order to make room for other and more interesting matter, including a section devoted to the Linotype, with the result of considerably adding, not only to the bulk but, it is presumed, to its general utility as a work of reference.

It is not suggested that this volume can be used as a text book, nor that all the varied information contained therein is of universal application, but in a general way it will be found useful to students, and especially helpful to workers far removed from those centres at which the many commodities and requisites so necessary to printers and the allied trades can be easily obtained.

The compiler once more conveys his best thanks to the editors of the various trade journals from which he has collected these *fragmenta*. In addition to those already named he is indebted to the

CAXTON MAGAZINE
LINOTYPE NOTES
MASTER PRINTER AND NEWSPAPER OWNER
INLAND PRINTER (U.S.A.)

and various other American magazines.

INTRODUCTORY TO THE FIRST EDITION

In putting this book before the Trade, the compiler offers his apologies and tenders his thanks to the proprietors of the various technical journals, both English and foreign, from which he has culled the bulk of these recipes, etc.; others are the result of his own practical experience. He trusts that this compilation—the result of many years' collection—will be found useful alike to the master and to the workman, for he believes no such work is at present in existence. It is hoped it will be of service to all interested or engaged in the art of printing and its allied trades. The want of such a book has long been felt, for, owing to the fact that the information is spread over a vast number of sources and repeated over and over again in different journals, there has always been a difficulty in turning up any particular subject when required. Further, the compiler has not had the opportunity of verifying all the matter contained in this work, so in many instances it has been reproduced exactly as it appeared from time to time.

If the demand should warrant a new edition at some future date, the compiler may be able to extend its usefulness, and he will be obliged by any hints, suggestions, or additional information suitable for the work being sent to him at the Chiswick Press, Tooks Court, London.

It is hoped the Index will be sufficient to find any particular subject, for it was found inconvenient to classify the multitude of items treated—at least for this initial edition.

Amongst others the compiler is indebted to the following English journals:

Paper and Printing Trades Journal.
Printing Times and Lithographer.
Printing Trades' Diary and Desk Book.
Press News.
Printers' Register.
British and Colonial Printer and Stationer.

1887.

PREFACE TO THE ENLARGED AND CLASSIFIED (SECOND) EDITION

THE compiler issues this Second Edition with a hope that it may prove as acceptable as at its first appearance. The facts that the first edition was soon exhausted, and continued inquiries were being made for the book, are the best excuse for its reappearance.

Much useful matter has been added, and an attempt has been made to classify it under the heads of departments or trades.

To have given more explicit acknowledgment would, perhaps, have been better, but, as intimated in the earlier preface, the same item is so frequently repeated in the different journals, and sometimes in a varying form, that it would have been difficult to have traced its origin. Owing to this repetition and variety in the mode of treatment, the reader's indulgence is requested if the compiler has failed in a few instances to discriminate between these duplicate fugitive pieces.

In addition to the journals named in the original preface, he is indebted to the following:

BRITISH PRINTER.
BRITISH BOOKMAKER.
EFFECTIVE ADVERTISER.
PRINTING WORLD.

1891.

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THE PRINTERS' HANDBOOK

OF TRADE RECIPES, HINTS, AND SUGGESTIONS

THE COMPOSING ROOM

3 THE SELECTION OF BOOK FOUNTS.—A good face of type is of the utmost importance, and should be the first consideration. A fount with extremely thick and thin lines is dazzling to the eye, and one in which the gradation from thick to thin is less marked is preferable. It should be borne in mind that the respective letters of the alphabet are based on certain arbitrary or conventional designs, and any great departure from the original forms would be considered unorthodox; consequently the character or design of the face should be plain and somewhat round in shape —not unduly condensed or ornate. The finish of the letters, by which is meant the serifs, is another point in the selection —these serifs should neither be too long nor too fine, too short nor too stumpy. A good feature is when the design has a graceful curve or spring from the serif to the stroke of the letter, whether it be from the top or the bottom of the particular character. The exact choice of size is often limited by such and such a volume having to be confined within a certain space. Where no limit is imposed, use as large a face as possible; a large type is always readable, whereas a small type, if not unreadable, is at least injurious to the eyesight. Two other things which improve or mar good printing are leading and spacing. Each is dependent

on the other. Long lines of type are best slightly leaded (in depth), and consequently the lateral spacing should be increased a little between the words. Equal spacing throughout any one line is important—in fact the aim should be to keep the whole page uniform in this respect. The mixture of various faces is objectionable. Use one character or class only, and limit as far as possible the number of sizes in any displayed work or title-page.

THE WEAR OF TYPE.—Mr. Theo. L. De Vinne says that the amount of wear which types may receive cannot be stated in figures. One printer will consider them worn out when another will think them capable of further service. Brevier and minion have sometimes received two millions of readable impressions upon newspaper work, but the thick press work from types worn by more than one million impressions would be accepted only by a newspaper publisher. Many publishers would reject small types which had received but three hundred thousand impressions. For the finest letterpress work the limit would be put very low. Typography with characters entirely faultless can be had only from new type. For typefounders' specimens and for sumptuous books new types are always provided. They are never reset, but are condemned to the melting kettle after their first use. The repeated handling of types is as injurious as the impression of the machine. One million of acceptable impressions may be obtained from small type skilfully made ready if these impressions are taken from one forme; but if the types are repeatedly distributed and reset for many different formes they will not furnish one-fifth of the number. The wear of types in the composing-room is much greater than is commonly supposed. They are bruised and battered in distribution and in composition, in making-up, and especially by planing down and correction. The moulding process of stereotyping is remarkably injurious. Proving with a brush, or moulding by the papier-maché method, is more destructive, in most cases, than any kind of printing machine. Nor can a more destructive agent be found than the stiff scrubbing-brush which is used, often by unskilled hands, to clean the formes from ink after they have left the press.

PURCHASING TYPE.—Before buying a fount try the metal by cutting it with a knife. The difference between good and bad metal will soon be discovered. Above all, do not be too anxious to buy cheaply. It is not always that a fount of type sold is worth the money paid for it. In buying job founts it is a profitable investment to purchase the whole of the series. Never ask a founder to divide a fount. It is often more economical to buy double founts, and thus avoid picking and turning for sorts. Too small founts are entirely useless. Quite a mistaken notion is it that cash not spent in new type is money saved. Find the man who has this mistake in his head, and who allows it to rule his business conduct, and you will most probably find one who is not troubled with a flourishing business. The reason is not far to seek. Although a single evil may be borne by customers, who can stand bad type, bad ink, and bad paper —especially when by going a few yards farther good type, ink, and paper can be relied upon? Some printers work their type as long as there is any of the stamp left, and then would like to turn it round and print the fount from the other end! Another mistake is made when it is supposed that an ornamental job is not a profitable one, simply because it takes time in composition. Of course this applies to a properly appointed office. It is certain that a good job can be done quicker in such a place than any kind of work can be turned out from a badly appointed office. In other words, it pays to keep pace with the times; and the advice is sound which recommends the printer to let nothing but the length of his purse restrain him in laying in new material.

THE PERSISTENCY OF CERTAIN TYPE FACES.—Although four and a half centuries have elapsed since the discovery of movable type, the gothic, roman, and italic letters still literally fill the eyes of the world. True, the Germans have made a slight concession in substituting romans for fractur in printing scientific books and periodicals; but the hold of the latter type upon the nation is as strong as ever. Italic hardly deserves to be classed with the other two great styles. It may be termed a "special type." Finding both the gothic and roman type, as cut in his day, too large to

enable him to bring out small editions of the classics, Aldus invented the italic, modelling it, as the legend runs, after Petrarch's handwriting. Anyway, it served his purpose very well, but no one to-day would think of printing a whole book in italic. And yet it is a most useful type. It would be a hard matter to get on without an occasional use of italic style. True, many of the "art printers" have banished the italic from the pages of their books, but authors accept the innovation with a poor grace. Roman type was cast as early as 1465, and gothic (black letter) made its appearance in England about 1479. De Worde was probably the first English printer to cut gothic punches and cast that type on English soil. The printer would turn a deaf ear to any proposition looking to a surrender of black letter. How would Bibles and Prayer Books look without gothic rubrics, etc.? That Germany will give up her fractur and adopt the roman is quite likely. But while it is an old saying that there is nothing more beautiful than handsome roman type, and it would be an excellent motto to set over the door of a book-printing office, remember that books are a small part of the printed matter daily put into circulation; typefounders might give a thought to the designing of a face in some other harmonious style which would serve to prevent the roman from becoming monotonous.

Barbed Spaces.—Attention has been drawn to a useful invention, which is intended to facilitate the keeping of type, ornaments, and so on, in blank cases. It consists of slips of white metal, with projecting spurs on each side, so that they can be firmly driven into the wood and fixed there. In this way the cases can be subdivided with the help of wooden sticks into a number of compartments with firm sides. It is claimed for this invention that: The stamps no longer fall down; pie is avoided; the stock of type can be controlled and the letters examined; the type is protected from injury and does not stick fast; the process of setting up and distributing the type is considerably facilitated, valuable spacing material, such as quads, clumps, furniture, etc., is saved; the cases can be kept in order for an indefinite period; compartments of any required size can

be formed instantaneously in no other way; ornaments, borders, rules, polytypes, electros, and similar things, can be preserved in the same way by the application of these spaces.

Wear of Type by Unsuitable Papers.—Mr. Theo. L. De Vinne has observed that on fine work a pressman is required to make, by overlays and underlays, the types practically parallel with the impression surface, so that the printed sheet shall show on the back only faint marks of impression. Yet careful make-ready is but a feeble safeguard if the paper has not been well selected and prepared. Rough-faced handmade linen papers, half-beaten straw or wood papers, and all papers that are laid, uncalendered, or of rough or ribbed surface, are, when printed dry, especially destructive to types. The durability of types is also affected by their uncleanliness and the want of care they may receive. If they are not thoroughly cleansed immediately after taking proof or leaving press, if dust and paper fibres are allowed to settle in the counters and harden with the drying ink, and if the sediment of the lye and turpentine used for cleansing is allowed to collect, a thick tenacious deposit will soon be formed which cannot be removed without nearly destroying the type. The counters of a fount of type so neglectfully treated will soon become filled up, and this may happen before the stems or the serifs have been appreciably thickened by the impression of the press.

Wear and Tear of Type.—It is immaterial whether type is cast in hard or soft metal if it is not properly used. The destruction of type by incompetent or careless workmen is a matter of serious importance to all printers. It is the rule, before a fount is half fairly worn out, for the finer parts of the letters to be utterly destroyed by rough and careless usage. To begin with the laying, where the type receives its first injurious blow: it is a common practice with some compositors, when laying new type, to empty a large paperful into their aprons, and then to toss it up and down, till all the fine corners are pretty well rounded off; and then it is pitched, head foremost—not slid gently,

feet foremost—into the cases, to be violently shaken about to rout it out of the corners whenever a case gets low. In the daily use of type by compositors there are many things which contribute to its destruction, and one thing is the want of cleanliness towards the type after it is worked off. Imposing stones and surfaces should always be kept perfectly clean, and before the careful compositor thinks of laying down his matter on it for imposition, he will thoroughly remove all dirt and grit by wiping it well down with a soft rag. Allowing type to be worked when off its feet is another most destructive process, because after it has been once so worked, it is never likely to be able to stand fairly upright again, and will also prevent its other more perfect neighbours from doing the same.

SELF-SPACING TYPE.—The following illustration explains the system recently introduced by an American foundry:

One unit.—Space	1
Two units.—Space, f i j l . , : ; ' - ! I ' '. Total, ...	14
Three units.—Quad, c e g r s t z ?) † ‡ §] ‖ ¶ I C J S T Z – °. Total, ...	25
Four units.—Quad, a b d h k n o p q u v x y ﬁ ﬂ ﬀ $ £ 1 2 3 4 5 6 7 8 9 0 C J S Z A B D E F G H K L N O P Q R U V X Y & ¼ ½ ¾ ⅓ ⅔ ⅛ ⅜ ⅝ ⅞ – ⌡ ⎬ ⎤ |. Total, ...	67
Five units.—w æ œ A B D E F G L N O P Q R T U V Y & M W Æ Œ ℔. Total, ...	25
Six units.—Quad, m ﬃ ﬄ H K M X — ... ℘. Total,	11
Seven units.—W Æ Œ @. Total, ...	4
Twelve units.—Quad, ☞ ☜ —— ...... Total, ...	5
Total to the fount........................	152

SMALL TYPE RUINOUS TO EYES.—Professor Kohn, of the Breslau University, Germany, has devoted a good part of his life to the study of the effect of small-faced and indistinct type print upon the eyes resulting from the reading of newspapers and books printed from such faces. He shows by examples how the impression, the paper, the ink, and the diminutive print frequently used run counter to

the rational hygiene demanded by the eyes, causing *myopia*, or short-sightedness—thus handicapping one in everyday life. In his view, the size of the type as well as its cut or form is a most important matter. He claims that for general reading or study no type should be used smaller than *korpus*, which corresponds in size to our 10-point. The number of school children who have been driven to the use of glasses is constantly increasing, and it is rare, indeed, to find a university graduate who does not finish his course wearing glasses. This comes partly from the persistent use of fractur or German type instead of the roman faces in use exclusively by the English, French, Spanish, and Italian speaking people of the world. He also insists that all matter should be "leaded"—and every reader will bear witness that leaded matter is less tiresome to the eyes than solid print. As to the form of the letters, Dr. Kohn's rule is, the simpler, the less ornamented, the better—blunt serifs or none—on the gothic order. He has no good word to say for the German type.

Hints on Ordering Sorts.—A typefounder has published a table containing a rough estimate (taking brevier as a standard) of the amount which the respective boxes of the regular full-sized lower case will contain; the first two columns give the letters and weight only, the last two columns the letters and number which will weigh a pound.

Letters.	Weight to Box.	Letters.	No. Letters to lb.
a c d i s m n h o u t r	2 lb.	a b d g h k n o p q u v x y z	582
f b l v g y p w	15 oz.	c e r s t	682
k j z x q and figures	6 oz.	m	398
e	3 lb.	f i j l	850
Caps	5 oz.	Periods and Commas	1400

TYPE MUSIC.—A music fount contains several hundred characters, and the few ounces of each character in a 100-pound fount do not go far in doing any amount of work. One must have the characters to use at different times, so the extras will amount to more than the original fount in a short time. Much work was formerly done with music type, but this kind of composition has declined, not one man being employed where four were formerly. The cause is the greater cheapness of lithography, by which, besides, ornamental lines of a beauty and grace which cannot be imitated by angular type can be introduced in title-pages. There are several methods of producing printed music besides through type and lithography. Engraving on copper is a slow and tedious process, and takes much time.

COMPARATIVE SIZES OF TYPES.—The following are the average number of ems which go to the foot. The types of some founders vary slightly in the measurement of their bodies.

Pica	... 72	ems	Minion ...	...122	ems
Small Pica ...	... 83	„	Emerald ...	...138·5	„
Long Primer	... 89	„	Nonpareil ...	...144	„
Bourgeois ...	...102·5	„	Ruby	...166	„
Brevier ...	...111	„	Pearl	...178	„

Example of use of the table: A book set in small pica 21 ems (pica) wide, 36 lines to a page, leaded 8-to-pica, occupies 600 pages. If the same book should be set in brevier solid, 18 ems (pica) wide, 45 lines to the page, how many pages will it occupy?

The proportions are as follows: 111 : 83, 45 : 36, 18 : 21. The fact that one book is solid and the other leaded need not be taken into account, as the difference is shown in the number of lines to the page. Therefore the number of pages required is $500 \times 83 \times 36 \times 21$ divided by $111 \times 45 \times 18$ $= 349$ pages. *Ans.*

Note. The faces should be of the same series; that is, proportional. If the small pica were a condensed letter and the brevier an extended, the number of pages would be correspondingly enlarged and *vice versa.*

RELATIVE SIZES OF TYPE, FROM PICA TO PEARL.

Pica.	Small Pica.	L. Primer.	Bourgeois.	Brevier.	Minion.	Nonpareil.	Ruby.	Pearl.
6	7	7½	8½	9	10	12	13½	15
7	8	8½	10	10½	11½	14	16	17½
8	9	10	11½	12½	13½	16	18½	20
9	10½	11	12½	14	15	18	20½	22½
10	11½	12½	14	15½	17	20	23	25
11	12½	14	15½	17	18½	22	25½	28
12	14	15	17	18½	20½	24	27½	30
13	15	16½	18½	20	22	26	30	33
14	16	17½	20	21½	23½	28	32½	35
15	17½	19	21½	23	25½	30	34½	38
16	18½	20	23	25	27	32	37	40
17	19½	21½	24	26½	28½	34	39½	43
18	21	22½	25½	28	30½	36	41½	45
19	22	24	27	29½	32	38	44	48
20	23	25	28½	31	34	40	46	50
21	24	26½	30	32½	35½	42	48½	53
22	25½	27½	31½	34	37	44	51	55
23	26½	29	32½	35½	39	46	53	58
24	27½	30	34	37	40½	48	55½	60
25	29	31½	35½	38½	42	50	58	63
26	30	32½	37	40	44	52	60	65
27	31	34	38½	42	45½	54	62½	68
28	32½	35	40	43½	47½	56	65	70
29	33½	36½	41	45	49	58	67	73
30	34½	38	42½	46½	50½	60	69½	75

OXIDATION OF TYPE.—Some one has said that he bought two dust-proof cabinets for the safe-keeping of some display founts. Now the type which has been placed in those cabinets is crumbling away. The surface of the type is almost gone, leaving a very fine white powder or dust all

over the letters, and many of them have so far disintegrated that they have become practically useless. The type has not come from one foundry, there having been at least four different makes in the two cabinets. Every typefounder, and probably every printer of long experience, has had trouble along these lines. There are many theories to account for the chemical action which results in this apparent disintegration, although in a thing so perfect as a single type a very slight imperfection will cause it to pass muster. These are but theories, and there is little scientific basis in most of what has been advanced, even by practical men. In one case, analysis of some type showed traces of zinc, and this is supposed to have united with the copper in the alloy which prevented the cohesion of the particles of metal. Again, new type from the foundry was thoroughly wetted in a printing-office fire. It remained untouched for weeks, and when the insurance was adjusted and the pages of type were opened it was found that all the type was more or less oxidized. Careful analysis of the wrapping paper showed the presence of sulphur-zinc. Damp type, in the original packing, not promptly opened to free circulation of air has in other cases been known to become covered with a fine white powder, the type itself appearing to be in good condition, save for discoloration. Type which had been for a long time lying unused in a vault which was frequently whitewashed was found to be oxidized, the result of dampness and the lime in the whitewash. Type which is washed with strong lye and not properly or sufficiently rinsed with clean water will also become covered with a white powder which seems to eat into the type more or less. A typefounder to whom the matter was referred said that he could offer no solution which would be helpful for the difficulty complained of. Citing various instances of type disintegration, he added that it was possible that the cases in these cabinets were paper-lined, that the type was washed with lye, imperfectly rinsed, and put away not thoroughly dry, or that there was some chemical in the paper which was released by this combination and which acted directly upon the type metal. This emphasizes the importance of cleanliness and care in handling type. Plenty of clean water after the lye, and the frequent use of the

bellows, even though type be kept in the modern compact and dustproof cases are employed to great advantage.

THE WAY TO RUIN TYPE.—Could types talk they would tell of some fearful encounters with a planer and mallet in the hands of an ignorant compositor. Why, the way the faces of the inoffensive types are battered in some offices makes one wonder how it is possible for them to print at all, and to marvel at the skill of the typefounder who can make types which will withstand such misuse. The way some men pound a planer causes one involuntarily to glance under the stone to see if any of the types have been driven through; and many and many a time the pounding is done on a forme so tightly locked that a letter standing above its fellows simply cannot be forced down to the general level, the consequence being that its face is battered and bruised beyond recognition. Before planing a forme, see that everything has been removed from it, that the planer is clean, and be sure the quoins are no tighter than they can be made with the fingers. Strike the planer lightly, and see that it lies flat on the type before striking it at all. If the planer rocks on the forme, and the pressure of the hand will not force down the portion responsible for the rocking, do not use the mallet at all, but investigate the matter at once, as the chances are there is something under the forme which must be removed before it can be planed down. Do not strike the planer a resounding whack with the mallet while it is an inch or more above the forme, thus making that peculiar double click so often heard, for, even if the blow is not hard, the planer never strikes the type square under such circumstances, and so the forme is not planed down in the least; instead, the sharp corner of the planer, striking the forme first and at an angle, breaks periods, commas, etc.; knocks the dots off the i's and j's and the tails from italic f's and y's; ruins the serifs of the letters, and causes other irreparable damage.

WHAT MAKES DURABLE TYPE-METAL?—Printers as a rule labour under the impression that type, to wear well, must be made of hard metal. This idea is now being combated as a fallacious one, and an article on this subject

says that the deep-rooted notion that hard metal makes the most enduring type is a mistaken one. It boldly takes the ground that the claims for a hard metal are a delusion and a snare, arguing that the mistakenly-prized hardness is obtained by using a large proportion of antimony, the cheapest metal next to lead; and that hard type, under the action of the planer and the press, and also in distribution, will suffer in the fine lines and serifs, these being easily broken. These grave objections can be readily obviated by making type of a metal which is not only hard but tough, and to accomplish this desideratum tin and copper, the most expensive metals in the alloy, should be freely used.

Recipe for Type-Metal.—Joseph Moxon, who was the first writer upon type-founding, printing, etc. (1683), gave as his recipe for type-metal the following proportions: 25 lb. of metal lead to 3 lb. of iron and antimony melted together. In Germany, about the middle of the last century, according to Smith, type-metal was a mixture of steel, iron, copper, brass, tin, and lead. It was told of a printer that he cast types "after a peculiar manner, by cutting his punches in wood, and sinking them afterward into leaden matrices; yet the letters cast in them were deeper than the French generally are."

Difference between Type Bodies.—The following list will show the degrees between

Small Pica and Pica	8	to pica.
Long Primer and Small Pica ...	16	,,
Bourgeois and Long Primer......	10	,,
Brevier and Bourgeois	20	,,
Minion and Brevier	16	,,
Emerald and Minion..............	30	,,
Nonpareil and Emerald	18	,,
Ruby and Nonpareil	16	,,
Pearl and Ruby	30	,,
Diamond and Pearl	24	,,

The Body Thickness of Italic Types.—The aim of the typefounders should be to produce materials as perfect

as possible in every way. Yet there is room for improvement, though the type of to-day is about all one could ask for. In regard to italics, it may be impracticable from the letter designer and founder's standpoint, but it would not be difficult to make each letter and character in a fount of body type the same thickness in the italic that it is in the roman, and this, too, without making the letters noticeably out of proportion. As a usual thing the italic letters average slightly thinner than the roman. This is not a serious fault, but it frequently happens that it becomes necessary to change roman to italic, or *vice versa*, after the matter has been put in type. If these changes could be made without respacing the line it certainly would be a convenience.

Proportions of English and French Type Metals.—English types are made of metal composed of 55 parts of lead, 22·7 of antimony, and 22·3 of tin; or 61·3 of lead, 18·5 of antimony, and 20·7 of tin; or, again, 69·2 of lead, 19·5 of antimony, 9·1 of tin, and 1·7 of copper. French metal is composed of 55 parts of lead, 30 of antimony, and 15 of tin. Besley's metal was composed of 100 parts of lead, 30 of antimony, 20 of tin, 8 of nickel, 5 of cobalt,. 8 of copper, 2 of bismuth.

Comparative Type Sizes in Points and by the Old Standard.

Size.		Lines to Inch.		Lines to Foot.		Ens to Sq. Inch.	
	Point.	Point.	M. & R. Old Gauge.	Point.	M. & R. Old Gauge.	Point.	M. & R. Old Gauge.
Pica	12	6·02	5·95	72·28	71·42	72·57	70·85
Small Pica	11	6·57	6·94	78·94	83·33	86·56	96·44
Long Primer	10	7·24	7·40	86·95	88·88	105·01	109·73
Bourgeois	9	8·06	8·54	96·77	102·56	130·07	146·10
Brevier	8	9·09	9·25	109·09	111·11	165·28	171·46
Minion	7	10·41	10·00	125·00	120·00	217·01	200·00
Nonpareil	6	12·04	11·90	144·57	142·85	290·31	283·44

This Table demonstrates the difference between Point and the ordinary sizes of types, and shows the need for care in not mixing spaces and sorts.

The German Point System.

German. German Name.	Didot points.	*English.* English body nearest to it.	Didot points.
Achtelpetit	1	$\frac{1}{4}$ Diamond	1·00
Viertelpetit	2	$\frac{1}{2}$ Diamond	2·00
Viertelcicero	3	$\frac{1}{2}$ Emerald	3·00
Halbpetit	4	Diamond	4·00
Perl	5	Ruby	4·82
Nonpareille	6	Emerald	6·00
Kolonel	7	Brevier	7·25
Petit	8	Bourgeois	8·00
Bourgeois	9	Long Primer	9·00
Korpus	10	Small Pica	9·75
Cicero	12	Pica English	11·25 12·50
Mittel	14	2-line Brevier	14·50
Tertia	16	Great Primer	16·00
$1\frac{1}{2}$ Cicero	18	2-line Long Primer	18·00
Text	20	2-line Small Pica	19·50
Doppelcicero	24	2-line Pica	22·50
Doppelmittel	28	2-line English	25·00
$2\frac{1}{2}$ Cicero	30	3-line Small Pica	29·25
Doppeltertia	32	2-line Great Primer	32·00
Kleine Kanon	36	3-line Pica	33·75
Grobe Kanon	42	4-line Small Pica	39·00
Missal	48	4-line Pica 5-line Small Pica	45·00 48·75

The Point System as applied to other Countries.

Germany: Cicero = 12 punkte.
British Isles and United States: Pica = 12 points.
France: Douze (twelve) = 12 corps.
Italy: Righa = 12 corps.
Holland: Augustijn = 12 punte.
Spain: Lectura = 12 puntos.

The above types are practically agreed to the pica or 12-point types of England and America.

Job Fount Schemes.

Founts of jobbing type are now being sold on the Aa basis instead of by weight. The following schemes, comprising a large and a small fount respectively, will therefore be found useful by some printers.

4A 20a Fount.						36A 70a Fount.					
A	4	a	20	1	5	A	36	a	70	1	16
B	2	b	8	2	5	B	16	b	24	2	12
C	3	c	12	3	4	C	22	c	34	3	12
D	3	d	16	4	4	D	20	d	36	4	12
E	5	e	35	5	4	E	42	e	92	5	12
F	2	f	8	6	4	F	18	f	24	6	12
G	2	g	8	7	4	G	18	g	24	7	12
H	3	h	16	8	5	H	22	h	44	8	12
I	4	i	20	9	4	I	36	i	70	9	12
J	2	j	5	0	6	J	10	j	16	0	16
K	2	k	6	$	4	K	10	k	12	$	10
L	3	l	16	£	1	L	22	l	44	£	5
M	3	m	12	&	5	M	20	m	32	&	10
N	4	n	20	fi	—	N	36	n	70	fi	7
O	4	o	20	ff	—	O	36	o	70	ff	7
P	3	p	12	fl	—	P	20	p	26	fl	5
Q	2	q	5	ffi	—	Q	8	q	10	ffi	4
R	4	r	20	ffl	—	R	36	r	70	ffl	4
S	4	s	20	,	20	S	36	s	70	,	50
T	4	t	20	;	4	T	36	t	70	;	14
U	2	u	12	:	4	U	20	u	34	:	12
V	2	v	8	.	20	V	10	v	12	.	50
W	2	w	8	-	8	W	12	w	20	-	18
X	2	x	4	’	8	X	8	x	10	’	24
Y	2	y	8	!	4	Y	12	y	24	!	14
Z	2	z	4	?	3	Z	8	z	10	?	12
Æ	1	æ	1			Æ	3	æ	4		
Œ	1	œ	1			Œ	3	œ	4		

Roman Type in Germany.—Roman type and script are slowly but surely making their way in Germany. The society for the abolition of the old German letters, which

in 1866 numbered only 2,871 members, now has about 4,500 on its list, which includes teachers, physicians, booksellers, and merchants. In 1886, according to Heinrich's "Bibliography," out of 6,213 books on artistic, scientific, and mercantile subjects, 5,316 were printed in roman type. As is well known, Bismarck set his face stubbornly against this reformation, which will, when fully accomplished, be for Germany, as well as for the rest of the world, a real blessing, inasmuch as their system of type and script has, as it were, shut the world out of their domain of letters.

APPROXIMATED TABLE OF TYPEFOUNDERS' SIZES.

Size.	Caslon and Co.	V. and J. Figgins.	Sir C. Reed and Sons.	Miller and Richard.	Stephenson and Blake.
	ems to ft.	ems to ft.	ems to ft.	ems to ft.	ems to ft.
English	64	64	$64\frac{1}{2}$	64	$64\frac{1}{2}$
Pica..................	72	$71\frac{3}{4}$	$71\frac{7}{8}$	$71\frac{1}{2}$	$72\frac{1}{4}$
Small Pica	$82\frac{1}{4}$	83	$82\frac{15}{16}$	83	83
Long Primer	89	90	$88\frac{7}{8}$	89	89
Bourgeois	$101\frac{2}{3}$	$101\frac{7}{16}$	102	$102\frac{1}{2}$	102
Brevier	111	$108\frac{1}{4}$	$110\frac{3}{8}$	111	$110\frac{2}{3}$
Minion	$121\frac{5}{16}$	122	122	122	$122\frac{1}{3}$

A PLEA FOR NEW FOUNTS.—It may be urged that the frequent buying of type loads an office down with too many styles; that cases cost money as well as type; and that, finally, the investment becomes greater than the business warrants. But it is useless to retain all the old or obsolete things, for they become unprofitable tenants after a time. Clear out all the oldest founts, making case room for the new. The old type has paid its way and served its purpose well; but now it is rarely, if ever, used, and its value as old type, towards the purchase of new, will be plainly greater than the idle occupancy of the cases. By rotating carfeully in this way the cost will not be felt.

Suggestion for buying Type in Series.—It is bad policy to lay in a fount of this face, a fount of that, and one of some other series. The effect on the work of the office is to give a confused appearance, for jobs in which half a dozen styles of faces are jumbled together cannot by any stretch of imagination be termed either attractive in design or successful advertisement displays. Besides, there is a distinct loss of time in composition, which in itself tends to spoil the effect of a job. Buying in series is also decidedly economical.

Copper-faced Wood Type.—Attention is called to a French invention, which, it is claimed, will cause quite a revolution in the typographic world. Experiments were made with the galvanic process and wooden type, which was successful in enduing the upper surface with a coating of copper. The importance of the invention can hardly be over-estimated, especially to those who use a great deal of wood letter and know its perishable nature. In order to produce what the inventor calls galvanized wooden type, the letters are placed in a galvano-plastic bath, and receive a coating of copper. The letter, while preserving nearly the lightness of wood, is as strong as metal, the copper coating rendering its form unchangeable, and preserving the wood from exterior influences and other risks which result from the ordinary manipulations to which type is subjected. The covering of the upper surface with galvanized copper has also the effect of preserving the delicate serifs of the letters, which are as strong as type-metal. The possibilities of its application, indeed, are indefinite; for instance, it may give wood engraving a fresh chance, as it may be possible, under this process, to use "cuts" for long numbers where now electrotyping has to be resorted to, much to the detriment of the artistic finish of the work.

Type made from Paper.—Type made from paper is the latest novelty. A process has been patented by which large type used for printing placards can be made from pulp. Such letters are at present cut on wood. The pulp is desiccated and reduced to a powdered or comminuted state,

after which it is thoroughly mixed with a waterproofing liquid or material—such as paraffin oil or a drying linseed oil, for instance. The mixture is then dried, and subsequently pulverized. In its pulverized state it is introduced into a mould of the requisite construction to produce the desired article, type, or block, and then subjected to pressure to consolidate it, and heat to render tacky or adhesive the waterproofing material. Finally, the type is cooled while in the mould, so as to cause it to retain its shape and solidity.

Emergency Wood Letters.—A few sticks of elastic glue are useful in a jobbing office. Very often an extra wood letter is wanted for a line, above the number supplied in the fount. This can generally be met by a little alteration or addition to another. Thus an A formed from V and *vice versa,* B from P, H from two II's, M from W, and by cutting L from T, etc., and in case the original letter is required it is but the work of a minute either to cut away the glue or to add it if the letter has been cut. A gas-jet and a pocket-knife are all that is needed. Work with the blade of knife warmed.

Weight of Type for Newspapers.—Country printers often ask how to estimate the quantity of type necessary for a paper of given dimensions. The following will be found a simple plan: A page of type 4 × 6 in. weighs about 6 lb. Let this be taken for a starting-point, and the weight of type when set up and ready for imposition will easily be found. Then add 40 per cent. to the weight arrived at to cover inequalities of sorts, and the letter necessarily lying in case, and this will be found near enough for all practical purposes. At the same time, make an allowance for over-matter and possible supplements.

Bastard Types.—Many printers and even typefounders apply the term "bastard" to types without knowing its meaning. Small pica and bourgeois are no more "bastard" types than long primer or pica. A "bastard" fount is one where a face from one size is put upon a body of another, as minion upon brevier body or *vice versa.* Small pica, bourgeois, etc., were first termed "irregular" bodies because

they varied from an imaginary standard instituted by some one in the early history of printing—probably based upon the difference of a sixth of a pica between sizes, as between pica and long primer, long primer and brevier, etc. As founders now make their bodies and faces by numbers it is doubtful if any real "bastard" founts can be found, except upon some of the daily newspapers, which demand large faces upon small bodies.

Sectional Type was first introduced into this country in 1878 by Messrs. Caslon and Co. It consists of a condensed sanserif, each letter being cut into two parts across the middle, which allows of the introduction of another line. It is quite distinct from mortised types, which are not cast to the ordinary rectangular shape, but are cut away in some of the open parts to allow of other letters being brought up close. Mortised types were invented by Mackellar, Smiths, and Jordan, of Philadelphia, and patented in 1884.

Stone Type.—It is announced that an attempt is being made to make printers' type of artificial stone. It is claimed that this stone can be readily moulded, and is cheap; that it is hard, yet sufficiently elastic to bear great pressure without injury, while the type moulded from it will readily take up, retain, and give off the ink. Of course it is much lighter than the ordinary type-metal. Another inventor has promised to produce for us galvanized large-sized wooden type—the top of the letter only receiving a coating of copper by a galvano-plastic application.

A Suggestion for Typefounders.—A great source of worry to the painstaking printer is the ugly gap which so often occurs in words all in capitals where the letters A, W, Y, etc., come into juxtaposition, particularly in large round-faced founts. A great deal of time is often spent in dovetailing such letters by means of rude implements—such as a saw, an old file, or a pocket knife—generally available in the average job office. The suggestion is made to progressive typefounders that a few in each fount of the letters (caps) A, F, L, P, T, V, W, Y, be cast or cut with a mortise in the open portion of them, so that they fit into

one another when coming together in a word. The word RAILWAY, for example, would be much improved in appearance if the last four letters came closer together by means of such mortising.

Weight of Type Required for a Job.—Divide the area of the page expressed in pica ems by 128. The answer gives the number of pounds weight in the page. Fifty per cent. for small founts, and 30 to 40 per cent. for large founts, should be added to allow for sorts, etc.

Example: Fifty pages of brevier octavo are to be set up, the size of the page in pica ems being 20×34. What fount of type should be ordered?

The area of each page is 20×34, equal to 680 ems pica; divide by 128 and multiply by the number of pages, 50. The result is 266 nearly. Add 40 per cent. and the sum will be 372 lb. *Ans.*

Fashions in Type.—There are fashions in type as in modes of apparel; and it is as unwise to attempt to stem the tide of fashion in these as it is foolish affectation for one to wear knee-breeches and powdered wigs to-day. But it is unnecessary to follow fashion to the extreme; and the small establishments can no more keep up with all the various styles than a printer's wife can dress like a millionaire's. There are certain standard faces of type which cannot be dispensed with in any office; but it is not advisable to choose the oldest cuts of these. One founder may have the matrices for the earliest styles of full-face, antique, etc.; but many of the latter shapes are vastly to be preferred as being clearer cut and better proportioned. Punch-cutting has greatly improved of late years, and it cannot be denied that a more artistic taste prevails than existed half a century ago. Even our plain romans are much improved, as will be seen on a comparison between the newspapers and books of 1834 and those of a later date. Some of the "improvements" in types, however, have been in a backward direction, as witness the grotesque and almost illegible styles which have appeared of late. It is not necessary that these ugly shapes should have place, and many of them should be tabooed.

The American Point System in Comparison with the old Bodies.

Point Body.		Old Name.
3	=	Excelsior.
3½	=	Brilliant.
4	=	Semi-Brevier.
4½	=	Diamond.
5	=	Pearl.
5½	=	Agate.
6	=	Nonpareil.
7	=	Minion.
8	=	Brevier.
9	=	Bourgeois.
10	=	Long Primer.
11	=	Small Pica.
12	=	Pica.
14	=	2-line Minion. English.
16	=	2-line Brevier.
18	=	Great Primer. 3-line Nonpareil.
20	=	2-line Long Primer. Paragon.
22	=	2-line Small Pica.
24	=	2-line Pica.
28	=	2-line English.
30	=	5-line Nonpareil.
32	=	3-line Small Pica. 4-line Brevier.
36	=	2-line Great Primer. 3-line Pica.
40	=	Double Paragon.
42	=	7-line Nonpareil.
44	=	4-line Small Pica. Canon.
48	=	4-line Pica.
54	=	5-line Small Pica. 9-line Nonpareil.
60	=	5-line Pica.
72	=	6-line Pica.

An Elastic-Faced Printing-Type is an invention constructed upon an entirely new plan, which involves the least possible amount of wear and friction, prints with the greatest ease, and ensures the most perfect results yet attained. It consists of a hard-bodied printing-type, whose printing character is made integral with the body. An elastic coating or cushion is moulded and vulcanized to the type body, the character projecting into the elastic coating, forming an elastic-faced printing character, which is supported and secured firmly in place by the type.

The Filling up of Type-faces.—Printers sometimes complain of this without being thoroughly acquainted with the facts. For instance, a writer recently insisted that larger "openings" should be made in some of the late black-faced letters to prevent filling up in printing. Now, it is not that the "openings" should be larger in order to ensure clear print, but that the counters should be deeper. The new

style of cutting dies on soft metal and electrotyping the matrix—superseding the good old steel punch driven into the solid copper, making a finished "drive"—is a cheap process and does not give the required depth to the counter so needful for good clear print. It is not so much the size of the "opening" as the depth which causes the ink to fill the spaces, particularly if the inking rollers are set too hard on the forme which is on the machine. Shallow counters in type, large or small, with large or small "openings," are apt to fill up in printing, while a deep counter will print cleanly. And to this may be added the fact that the metal being of equal quality the deep-counter type has more wear in it.

The Sizes of Types.

Double Pica	is	2-line	Small Pica.	4½	ems	Great Primer	is	1 inch.
Paragon	is	,,	Lg. Primer.	5½	,,	English	is	,,
Gt. Primer	is	,,	Bourgeois.	6	,,	Pica	is	,,
English	is	,,	Minion.	7	,,	Small Pica	is	,,
Pica	is	,,	Nonpareil.	7½	,,	Long Primer	is	,,
Small Pica	is	,,	Ruby.	8½	,,	Bourgeois	is	,,
Lg. Primer	is	,,	Pearl.	9½	,,	Brevier	is	,,
Bourgeois	is	,,	Diamond.	12	,,	Nonpareil	is	,,
Brevier	is	,,	Minnikin.	17⅓	,,	Diamond	is	,,

A shilling standing edgewise is roughly type high.

What is Type-Height?—Careful tests prove that, from one cause or another, considerable divergence exists in the height of half-tone and line blocks, electrotypes and stereotypes—all supposed to be sent out exactly "type-high." This must, indeed, be a very elastic term if it fits the varying heights one meets with. Inquiry seems to show, as one result, that there is some uncertainty as to what is type-height, and therefore all those engaged in supplying blocks and kindred supplies to the printer should remember that type-height is ·9175 inch. This is obtained from the standard agreed upon between the Associated Type Founders, who may be taken as representing the entire industry in this matter, for none will seriously question the accuracy and reliability of their product to-day. Such measurement is chiefly for the use of photo-engravers, electrotypers, and others in the supply trade. Four places

of decimals may not prove easy to remember and to use, but it is well for printers to know what the real type-height actually is, and to have their gauges made accordingly.

Ordering Sorts.—The twelve square boxes directly in front of the compositor, containing the letters a, c, d, i, m, etc., will hold about 2 pounds each. The boxes half the size of the "a" box will hold 15 ounces each, containing the letters f, b, g, l, p, etc. The small square boxes containing the letters k, j, q, etc., will hold 6 ounces each. The "e" box 3 pounds, and the cap case 5 ounces to the box. The best way to order sorts for display type is to do so by "irons." A typefounder's "iron" is about 20 pica ems long.

The Parts of a Type Named.—The *face* is the part from which the impression is taken. The *counter* is the sunk space existing between the lines of the face. The *nick* is an indentation cast in the body of the type. This is always placed on the side leading up to the bottom of the face. The *shoulder* is that portion of the type not occupied by the face. The *beard* comprises the bevelled bases running from the shoulder to the face. The *pin mark* is a small circular indentation on the side of the body. This is formed by the pin which holds the type in the upper half of the mould, and acts as a drag to deliver the type. The *height to paper* is the distance from the face to the feet of the type. The usual height is eleven-twelfths of an inch. The *body* of a type is the thickness from back to nick. The *feet* are the portions supporting the type, each side of the groove, and are formed in the process of planing off the superfluous metal left at the point where the jet has been removed.

Who should pay for Special Sorts?—There are certain facilities which may be considered standard and which a customer has a right to expect the well-equipped printer to have. It would not be fair to charge a customer extra for leads to space out his work with, but not one whit more so than not to charge him extra for special sorts which can never be used again. It is fair, however, that the customer should pay the full cost of special type, which can be used

for him only, just as he pays for paper and press work. The printer should not pay for special sorts any more than for special engravings. The cost of all type comes very near to belonging to the expense account, and certainly that which is not a standard facility, which can probably never be of general use, should invariably be paid for by the customer for whose work it is purchased.

THE DISTORTION OF TYPE FACES.—There is a growing disposition to distort the form of letter in type faces, apparently in pursuit of fresh effect; and in some cases this has been done in a degree altogether beyond reason, and so as to make the character quite unrecognizable. There are some faces in which the loop of the capital P is brought down so low to the foot as to become almost a D. The capital R has been treated in like manner so that it has no room for its foreleg. The capitals E and F have assumed new forms by the extension of the middle member beyond the upper and lower, and, together with the cross bar of the H, it is thrown within an ace of the top member in a manner that is ridiculous. The unfortunate S is in some cases reduced to a mere wave of a line, and in others lies nearly flat; while the O becomes an entirely new letter half its proper size, now in the air with nothing to support it above, which is meaningless and absurd. Another form of disfigurement that has become common in this attempt at novelty is to take some particular letter and make it fall backwards. The lower-case o, e, and a are thus treated, with most disagreeable effect to the reader; and there are several founts in which the right-hand leg of the n, m, and h is in each case thrust out as if it had been broken. These distortions have their origin in the work of the illustrator, who being required to put a title to his design, and being unable to draw the letters accurately, has resorted to irregularity to cover his incapacity. The artist-engraver sometimes indulges in extravagances from inability to maintain uniformity. Novelties in typography are to be encouraged; but to be permanent and satisfactory they must not rely upon distortion. A new face should in all cases be characterized by some special form or turn to be found in every letter to a smaller or greater degree, and this cardinal principle is not

complied with when a founder seizes upon a particular letter in the alphabet and gives it a character that is not found in its fellows.

Recipe for Owltype.—Take a very heavy coloured railroad board, or thick glazed mill-board, and if very smooth pass a damp sponge or rag over the surface, to take off any heavy gloss. Then take China white, or any fine clay, mix it with water to make a paste about as thick as common molasses, adding a few drops of mucilage to a wine-glass full of the softened clay. The less mucilage the better, though some is required to prevent the clay peeling off the cardboard too easily. Use a rag, spatula, or small pencil brush in applying the softened clay to the cardboard, of course leaving spaces or spots on the cardboard uncovered by the clay. These spots will produce the solid parts when printed. The clay dries rapidly, so that the matrix may be placed in the stereotyping backing-up pan and cast almost immediately. Then block and trim and put on press.

Leads required to Justify with Type from Pearl to Great Primer inclusive.

Pearl	One four and one eight-to-pica.
Ruby	One four and one six-to-pica.
Nonpareil	Two fours; three sixes; or four eights.
Emerald	One four, one six, and one eight.
Minion	One four and two sixes.
Brevier	Two fours and one eight.
Bourgeois	Three eights and two sixes.
Long Primer ...	Three fours; or six eights.
Small Pica......	Two fours and two sixes.
Pica	Four fours; or six sixes.
English	Three fours and two sixes.
Great Primer...	Four fours and two sixes.

Casting Leads.—The casting of leads is by no means easy, especially if long ones are required. There is a good deal of knack in the operation. The mould must be kept hot and smoked over a flame from time to time, or, better, rubbed over with a thin solution of jeweller's rouge in water. This greatly assists the metal to fill the mould.

"Chaostype" or "Selenotype" is said to be quite simple, and consists of pouring quickly, but not continuously, melted metal into a *cold* stereo casting-box in which the shape required has previously been arranged, with the help of core bars, or the whole box can be filled and cut to sizes afterwards. That is the sole mystery, but the various "chaotic" patterns are the result of practice in dropping in the metal.

Origin of the Various Sizes of Type.—Formerly there were seven sizes of type. The first was called "prima," whence the name prime, but this sort is now termed two-line english. The second was "secunda," which is our double pica; in France, great paragon. The third was "tertia," now called great primer. Then there was the middle size, still called in German "mittel," but this is now our english. After these came the three sizes on the opposite side of the scale—pica, long primer, and brevier. In Germany the names secunda, tertia, and mittel are still retained. Pica in France and Germany is called "Cicero," because the works of that author were originally printed in it. English printers so styled it from its being the type in which the ordinal or service-book of the Roman Church was originally set. This ordinal was first called the pica, or familiarly, pie. Bourgeois was so named because it was introduced into this country from France, where it was originally dedicated to the bourgeois or citizen printers of that capital. Brevier obtained its name from its having been first used in printing the breviary or Roman Catholic abbreviated church service-book. Nonpareil was so named because on its introduction it had no equal, being the smallest and finest type produced until that time. Pearl is of English origin. The French have a type of the same size which they call "Parisien." It was a smaller type than nonpareil, and was thought the pearl of all type. Diamond is another fancy name given to what was regarded at the time of its origin as the greatest of letter-foundry achievements. One or two sizes besides have been made, and capriciously named by their respective producers. There is no doubt, however, that the best, because the most scientific and accurate, system of designing types is the

French system—according to "points." Here in England typefounders naturally object and hesitate to adopt an innovation of so revolutionary a character, hence the present time-honoured names are likely to hold their own in the terminology of the printing office.

Type Cases.—Printers' cases should always be selected with a view to accommodating their type in the most accessible manner, and without crowding. Delicate faces, like scripts, should never be laid in cap cases, or crowded into the boxes, nor should founts without lower case be laid in italic cases. Never lay two founts of type in the same boxes. The time wasted in setting it out is soon enough to pay for another case. Use cap or triple cases for all-cap founts, according to their size, and do not under any circumstances lay delicate faces with heavy type. Never crowd type together. It is not only disastrous to the faces, but is a loss of time in setting. Every printing-office should have, as a part of its regular quota of cases, a figure-case for extra figures, a space and quad case containing all sizes for spacing job work and advertisements, and blank cases for cuts, etc. These are no luxuries, but the best of investments, and any printer who purchases them will find that he is amply repaid in a short time. "A place for everything, and everything in its place," applies with greater force to a printing-office than almost any other place of business in the world. It is made up of numberless articles and appliances, any one of which is liable to be called into use at a moment's notice. The most perishable and costly portion, with the exception of fine type, are the cuts and electros. They should, therefore, be given a safe and convenient place of storage. The blank cases, which will fit into any frame, are the cheapest for this purpose.

Method of Laying New Type.—The careful laying of new type into case is a work of greater importance than most printers believe. It is too often intrusted to apprentices, without instruction as to the method of doing it, the result being often seen in cases of pie and a large proportion of battered letters. The following plan is recommended on laying a new book-fount, and on no account should a learner

be allowed to undertake the work before he can distinguish from each other the letters b q, u n, d p, as well as the small capitals c, o, s, v, w, x, z, from the same letters in the lower case. In regard to these small capital letters, however, some typefounders adopt the plan of giving them an extra nick to distinguish them from the lower-case. Carefully unwrap the page received from the founder, and, laying it on a galley, let it be thoroughly soaked with thin soap-water, to prevent the types adhering after they have been set up and worked off; then, with a stout rule or reglet, lift up as many lines as will make about an inch in thickness, and placing the rule on one side of the bottom of the proper box, slide off the lines gently, taking care not to rub the face of the letter against the side of the box. Proceed thus with successive lines till the box is filled. Careless compositors are prone to huddle new type together, and, grasping them in handfuls, plunge them pell mell into the box, and then roughly jostle them about to get more in. The type left over should be kept standing in regular order until the case needs replenishing. A fount of 500 lb. of pica may have, say, five pairs of cases allotted to it; the same amount of nonpareil from eight to ten pairs of cases.

The Study of Type Harmony.—Modern compositors are of one mind in regard to using as few type faces as possible in one piece of work, or on one page of display, and the old custom of exhibiting half a dozen entirely different and inharmonious styles together has nearly gone out of practice. Still, we often see a newspaper advertisement, book-page or letterhead set in two series of type which are not adapted to each other, or in some type which is not in harmony with its environments. To the student of beautiful typography these things are offensive. To see an italic heading run over a roman paragraph looks out of place, and it is improper to use an italic initial to start a roman paragraph. In a greater or lesser degree, all types either do or do not harmonize with each other. Every type face, cast by any foundry, has a character of its own; each has a distinct language of expression, and is particularly appropriate for its respective place, and correspondingly unsuitable if wrongly used. Each letter was designed for

some special purpose, and the compositor shows his superiority by studying and putting into practice his knowledge of its fitness, in using good judgement and taste in selecting a proper design for the particular work in hand, and by not mixing two or more inharmonious faces in the same piece of composition.

Arrangement of the Composing Room.—This is a matter which generally receives too little attention. It is just as easy to place things so that they will be handy as it is to scatter them so that the men are forced to walk half a block every time they want anything. Do not have more than two frames side by side, and do not have one end of the two against the wall, but, if possible, leave about eighteen inches of space between frame and wall, so that the compositor can get to the next alley without loss of time. Do not put cases of much-used type in racks where their use causes one man to step aside and wait while another is setting a line. Have two or more cases of faces which are frequently used, so that if more than one compositor wants the same kind of type at the same time it will not be necessary for one to wait until the other has finished. Such ideas are contrary to general usage: but if a little more attention is given to composing room arrangement a large amount of time will be saved.

Hints on Composition.—Understand the copy fully before leaving the foreman or copy hook. Time spent in this way is profitably invested. At least read through the outlines of the job. If pamphlet or bookwork, the reading of the first page or two will be sufficient. Formulate some plan of development. Determine upon display lines. Spelling, style of punctuation, capitalizing, and paragraphs, should be according to usage of establishment. If possible, absorb the subject of the take; it will render work more engaging. As to rapid composition, absolute oblivion to surroundings is essential. Like an actor or orator, one should mentally get inside of the subject; shut out the other senses, and utilize that which is necessary to rapidity and correctness. Some have a new sense created by rapid composition, combining mental and physical phenomena,

rare and wonderful. As in distributing, stand square on the feet, with chest distended. Hold stick well in front, so as to be in full view of left eye, while the right generally is controlling movement of picking up letter and reading copy. Type should be grasped with the right-hand thumb and forefinger, with a sliding approach, so as to lift with finger and balance with thumb. After catching the word with the eye and mind, concentrate on the immediate letter to be picked up, with an active plunge of the hand toward the box, without the pressure of nerve force if possible; bring back letter swiftly to stick, striking rule as near as possible to location of word. Seize letter with left thumb and strike out with right hand immediately for next letter. The casting of hand into box, seizing letter without hesitancy, and the withdrawal to stick, should be of same velocity. The movement, physical and mental, generally determines the speed of the compositor. Rapid composition comes from mental anticipation coupled with will power, and can be cultivated.

Preparation of Copy.—Authors and editors are often careless in this matter, which means so much in a well-printed book, and if not done is such an offence to a well-informed reader. In fact, all technical points have to be attended to, and all this accrues to the detriment of the profits in composition. To make such work profitable is to start at the beginning, and the sooner employers make up their minds to this fact the better. Why not insist on having copy in a good shape for the compositors? Is this asking too much? If good copy cannot be insisted upon from the author or publisher, it would pay the office to let some competent person in the office, who knows the style, prepare it so that the compositor can literally follow copy. Then keep the proof-reader's "hands off," only to correct real typographical errors. This is the whole thing in a nutshell, and when this is done, and not until then, will this constant warring about expenses in the composing-room be obliterated. In preparing copy four principles should be adhered to by the person so employed: First, see that quotations in matter are properly marked; second, every figure which is to be spelled out according to the

rules of the office should be ringed, so that the compositor will know positively when to do so, and thus avoid undue wrangling between him and the reader; third, delete all unnecessary markings on copy, such as a too profuse use of italics, small caps, etc., unless insisted upon by publisher's express orders; and fourthly, make some rule in regard to the use of capitals which will be clear to the compositor, and adopt some system of marking which will leave no doubt as to what is wanted.

Weight of Leads Required for a Job.—Multiply the number of lines in a page by the number of pages to be leaded, and divide the product by the number of leads of the measure required which weigh a pound (see separate table, p. 36).

Example: There are 24 pages of matter set to 21 ems pica to lead (8-to-pica), with 35 lines to the page. How many pounds of leads will be wanted? The table gives 54 8-to-pica leads, 21 ems long, weigh a pound. Therefore, divide 35×24 by 54 and get 15 lb. 10 ozs. *Ans.*

Note. Order 20 lb., cut to the right measure, to be sure of having enough.

First Use of the Setting-Rule.—This useful little implement was quite unknown to the early printers, and up to the time of its first adoption the lines of type (except in the case of the larger founts) varied in length like the lines of the manuscript, because the compositor was unable, without frequently breaking the line, to shift the words in order to increase or decrease the normal space between them. When setting-rules were devised, it so facilitated this operation, and, by making all the lines of an even length, so improved the symmetrical appearance of the pages, that no printer, after once trying it, returned to the old plan. In 1467 Ulric Zell, of Cologne, was unacquainted with this improvement, but as, out of the great number of works which issued from his press, it is a rarity to find lines of an uneven length, it is safe to conclude that he adopted it about 1468-9. But Meinsion, at Bruges, did not use it till 1478, ten years later, while it took nearly ten years more to cross the Channel to Westminster, where Caxton adopted it in 1490.

THE NUMBER OF ENS CONTAINED IN A PRINTED PAGE, FROM PICA TO NONPAREIL INCLUSIVE.

Length.	Width.	SIZE.	Pica.	Small Pica.	L. Primer.	Bourgeois.	Brevier.	Minion.	Nonpareil.
Picas.		*F'cap.*	Ens.	Ens.	Ens.	Ens.	Ens.	Ens.	Ens.
41	30	4to	2460	3243	3825	4988	5796	6900	9840
32	18	8vo	1152	1517	1800	2346	2695	3180	4608
28	15	12mo	840	1088	1295	1680	1978	2350	3360
19	15	16mo	570	748	888	1134	1334	1600	2280
21	12	18mo	504	672	780	1020	1184	1400	2016
		Crown.							
48	34	4to	3264	4290	5040	6693	7696	9120	13056
36	21	8vo	1512	1968	2340	3060	3520	4200	6048
32	16	12mo	1024	1369	1600	2116	2401	2809	4096
23	16	16mo	736	962	1160	1518	1715	2014	2944
23	15	18mo	690	884	1073	1419	1610	1900	2760
		Demy.							
54	42	4to	4536	6014	6968	9240	10707	12600	18144
42	24	8vo	2016	2640	3120	4080	4810	5600	8064
36	19	12mo	1368	1804	2115	2754	3190	3780	5472
26	20	16mo	1040	1380	1600	2109	2440	2838	4160
28	16	18mo	896	1184	1400	1840	2107	2491	3584
21	12	32mo	504	672	780	1020	1184	1400	2016
		Royal.							
64	48	4to	6144	8140	9401	12604	14652	17120	24576
48	27	8vo	2592	3410	4020	5313	6142	7290	10368
40	21	12mo	1680	2208	2600	3420	3968	4690	6720
29	21	16mo	1218	1584	1872	2520	2880	3430	4872
32	18	18mo	1153	1517	1800	2346	2695	3180	4608
24	14	32mo	672	896	1050	1360	1591	1880	2688

The above figures are subject to the slight variations in founts from different foundries.

The Justification of Type Matter.—Perfect justification is as rare as it is important, but even printers who are reputed to be adepts are frequently very lax in this respect, and so lost time and spoiled work through faulty justification is often the cause. It causes material to rise in the forme and spoil sheet after sheet before the machineman notices the defect; and the stoneman sometimes spends hours placing odd bits of cardboard all through a forme before he can get it to "lift" properly. It also allows the rollers to pull letters out of a forme and deposit them on the face of type or cuts, thus causing expensive delays and ruining costly material. The remedy is to teach apprentices —and journeymen, too, for that matter—that before a line can be justified it must be squarely on its feet. If a line leans slightly it will be short as soon as it leaves the stick, no matter how tightly the compositor spaces it. The best thing is to provide material that will enable the compositor to justify perfectly and quickly, not strips of cardboard.

Justification of Curved Lines.—When it is necessary to put a curved line in a job, set the curved line first, and secure it so that it will lift and hold together independently of outside pressure. This can be done by setting it in a patent brass curve and clamp, but when these are not available, set the line in curved leads. When the line is accurately spaced, carefully read to see that it is all right, and each letter curves properly, take a piece of paper, put mucilage on it, and apply the mucilage to the line. Put a little mucilage between the paper and the curved lead. When this dries the line will lift like a slug. Before distributing such lines, let them soak in water, kept in a saucer, and then carefully clean off the mucilage. This practice will save much time when the forme goes to press, and if properly done will ensure a perfect curve.

John Southward on Spacing.—Spacing is the art of putting the proper spaces between words, with a view to securing the most symmetrical appearance, while making the line of a proper length. In poetry every line differs in length, and all that is usually necessary is to get the words as far apart as will give them a neat and orderly appear-

ance. But in prose matter, which is "run on" like that in the present paragraph, the lines must all be of one length. This uniformity of length is obtained by the use of spaces of various thicknesses. The compositor has ready to his hand the following spaces—the hair space, the thin space, the middle space, the thick space, and the en quad, which, for this purpose may be regarded as one of the spaces. It has been previously stated that a 1-em quad is equal to two en quads, or three thick spaces, or four middle spaces, or five thin spaces. This should be impressed upon the mind, and the relative thicknesses of the spaces to each other will be understood, thus: 1 em = 2 ens = 3 thick spaces = 4 middle spaces = 5 thin spaces. The art of spacing is simply this: ascertain how much space there is at the end of the line, and divide that by the number of openings between the words. If there were an opening equal to two ems to space, and eleven words in the line, there would be ten openings, and as (by the formula above) ten thin spaces are equal to two ems, ten thin spaces would be used, in addition to those already inserted. If with the same vacant space there were only seven words (six openings), thick spaces would be used, for six of them would just extend the line to its proper length. It is by this means that modern printers render all their lines uniform in length.

Mr. Theo. L. De Vinne on Spacing.—Uneven spacing between the words of a line is a common fault. Bookwork requires that the space between the words of a line shall seem uniform in width, but to produce this appearance of uniformity spaces of different thickness must be selected for use between types of unlike form. The tall d at the end of one word and the tall h at the beginning of the next word call for a thicker space than that selected for the meeting of two round types like o and e in a similar position. The space after a comma or an abbreviating period may be thinner than that used after an unpointed word. These may seem trifling niceties, but their neglect damages the appearance of print. The space most acceptable between entire words in solid and thin-leaded composition is the three-to-em space; and it should be used on all types with round letters of ordinary height, in which

the height of the m is about one half that of the body. If the round letters are higher, occupying a much larger part of the body, spacing may be wider; if they are lower, as in the case of a brevier on bourgeois body, spacing may be narrower. Wide-space fat type; thin-space condensed type.

How to Cast-off Copy.—Although entirely exact rules for casting-off copy cannot be laid down, the following may be recommended as the result of experience. After having made up a composing stick to the measure proposed for the width of the work, take an average page of the copy, and set from it until a certain number of lines of the manuscript come out even with a number of lines of types. From this a calculation can easily be made for the whole of the work. Suppose a manuscript of 250 pages, and 31 lines in a page, be brought into an office, and it is required to determine how many pages it will make in long primer, the page being 28 ems wide and 40 lines of type in length; and it is found, by setting up a few lines, that 9 of the manuscript are equal to 7 of the type. Then:

250 pages manuscript.
31 lines in a page.

250
750

7750 lines manuscript.

9 : 7750 : : 7
7

9) 54250

40)602,7 lines of type.

151 pages of type.

The number of sheets can be ascertained by dividing 150 by 8, 16, or 24, according to the size of the signature in which the work is to be printed.

NUMBER OF LEADS IN A POUND.

Lengths	4 to Pica.	6 to Pica.	8 to Pica.	Lengths	4 to Pica.	6 to Pica.	8 to Pica.
4 ems	144	216	288	26 ems	22	33	44
5 ems	112	168	224	27 ems	21	31	42
6 ems	96	144	192	28 ems	20	30	40
7 ems	82	123	164	29 ems	20	30	40
8 ems	72	108	144	30 ems	19	29	38
9 ems	64	96	128	31 ems	19	28	38
10 ems	56	84	112	32 ems	18	27	36
11 ems	52	78	104	33 ems	17	26	34
12 ems	48	72	96	34 ems	17	25	34
13 ems	44	66	88	35 ems	16	24	32
14 ems	41	61	82	36 ems	16	24	32
15 ems	38	57	76	37 ems	15	23	30
16 ems	36	54	72	38 ems	15	22	30
17 ems	34	51	68	39 ems	15	22	30
18 ems	32	48	64	40 ems	14	21	28
19 ems	30	45	60	41 ems	14	21	28
20 ems	28	42	56	42 ems	14	21	28
21 ems	27	40	54	43 ems	13	20	26
22 ems	26	39	52	44 ems	13	19	26
23 ems	25	37	50	45 ems	13	19	26
24 ems	24	36	48	46 ems	12	18	24
25 ems	23	34	46	47 ems	12	18	24

THE NECESSITY FOR DISTRIBUTION.—It is better to have nothing to do with a job unless one is fully prepared to call upon the typefounder for assistance. Various printing houses at certain times of the year are very busy. Not possessing a large assortment of founts, and these founts not very weighty, they soon begin to feel the pinch. Forme after forme is dropped, here, there, and everywhere, leads picked out, then some one picks out letters and quads, until very soon there is nothing but a mass of pie. Their rule is that distribution must not be done if there is any setting in the office. This is a great mistake, and one which is being made every day. Employers require men

to go searching for letter and even quads instead of allowing them to put in a few handfuls of distribution. Type is, without a doubt, cheap when compared with time lost. It should not be forgotten that when it goes into pie type takes twice as long to put into case. Quads are of the utmost importance, for without quads it is almost an impossibility to proceed. Even when running short of new faces a tolerable job may sometimes be set by a good workman, but if there are no quads setting is quite out of the question. There should be in every office a large surplus of spaces and quads for emergencies, the latter kept in boxes plainly labelled so that there need be no fear of mixing. The shortage, in some printing offices, will be lessened somewhat when employers come to look upon distribution as a necessity; at the present time it is only looked upon as a "filler." It is absolutely necessary in large offices that certain men should be kept constantly on distribution, in order that cases may be kept well stocked.

Sizes of Type to Reset a Book to half the Size or Number of Pages.—Bourgeois will make about one-half of pica; brevier of small pica; minion of long primer; nonpareil of bourgeois; ruby of brevier; pearl of minion; and minikin of nonpareil. The questions must be worked by square term comparisons, if any test is required.

The Composing-Stick.—This implement was first introduced in 1480. Previous to this the method of composition was by taking the letters direct from the boxes, and placing them side by side in a coffin made of hard wood, with a stout bottom, and kept tight when completed by means of screws at the foot.

A New Composing-Stick has a movable arm which comes at the beginning of the lines, is in two parts, and is secured by two screws. By loosening the one which is nearest the matter it can be instantly set for a half or third measure, or for any number of ems, while the moment this ceases to be requisite it can be drawn back till it meets the other part, when it is again at the full measure without a second's loss.

Keeping Special Sorts.—The composing room is from time to time called upon for work requiring an excess of sorts of some particular fount, yet their existence is sometimes forgotten. In most printing offices these special sorts are stowed away in the top boxes of the case if of job founts and room can be found, or they are put in a box and stowed away on a shelf. Even in those offices having modern sort drawers, special job sorts are not always to be found at a moment's notice. An easy remedy for this is a card index of all special sorts, rules, borders, ornaments, and things not often used, with a record of the amount of each, and the date of their last use and condition at that time. To be sure that they are in place when wanted, such sorts should be put in a special closet or cabinet, which should be kept under lock and key, and no one allowed to get at them without the foreman's order. Try the plan of keeping these things all in one place, and a record of what you have, and it will soon save the cost of the indexing.

Adjusting Widths of Bookwork.—Never use quadrats for making measures, as they cannot be depended on, but use lower-case m's turned on their sides, thus:

m m m m m m m m m m m m m m m m m m m m m m m m m

Choose the m's of a reputable founder, and make it a rule to use only that particular fount for such purposes.

The Indention of Typewriting Type.—A point overlooked in facsimile typewriting work is the proper amount of indention for paragraphs. The typewriter, it should be remembered, makes spaces of a width exactly equal to the uniform width of all letters on the keyboard of the machine. Now as in typewriting the paragraph indention is made by repeated depressions of the spacing key, it follows that the indention is necessarily some multiple of the width of letter used on the machine whose work is to be duplicated, consequently the letters on a good page of imitation typewriter work should be aligned perpendicularly as well as laterally. To this end the paragraph should be indented either with a number of the spaces provided with these founts of circular letter or else with such a combination of spaces and quads as will be exactly equal to

some multiple of the set of the letter in use. The common practice of indenting the beginning of the paragraphs of such matter with the em quads of the same body destroys the alignment perpendicularly of the letters by starting the first line of each paragraph on a different set from the lines in the balance of the paragraph.

Hint for Case Racks.—Leave an empty place in all long case racks, at a convenient height for placing a case out of such rack in which to distribute a line or two, or to set up a line, instead of having to carry such case away.

Wooden Furniture.

Double Broad is	8	ems pica	wide.
Broad & Narrow	7	,,	,,
Double Narrow	6	,,	,,
Broad	4	,,	,,
Narrow	3	,,	,,

the smaller sizes come under the head of "reglet."

Rusty Imposing Surfaces.—If need be the stone should receive a thin coating of oil well rubbed in with a rag, for there is nothing more unsightly than rusty chases, rules, etc. A little oil used here and there works wonders, especially in damp weather. Standing matter soon becomes rusty underneath, and is never capable of doing good work when once thus affected.

Springing of Formes.—A common fault of many compositors is to place a number of leads together. In fact, some put eight thick leads or more in one place when spacing-out, thereby making the forme springy. In whiting-out, the spacing should be as solid as possible, and in place of eight three-point leads, a piece of two-em furniture or its equivalent in quads should be substituted. If this were done less would be heard of springing formes. Every one knows that the more solid the forme, the less fear of springing. The best way of inserting matter in a pierced block so as to keep down spaces and quads is the following: First of all place a lead on all four sides of

matter, then fasten type in position. Afterwards turn the block over to see if the feet of the types are down perfectly flat. When blocks are pierced they are sometimes broken at the back or cut under, and this in many cases causes trouble unless packed very solid from the back. Such work runs far better when fastened by the feet than by the top of the letter. Then, again, by driving a couple of tacks into block over the leads and bending over, very little trouble will result therefrom. Supposing that a quarto circular has been set, the majority of compositors would simply place it in chase and lock up without more ado. This is a mistake. Before inserting quoins, pressure should be brought to bear with the fingers and an attempt should be made to rock the matter. It is surprising at times to find how much deeper the matter is in the centre than at sides. It is an easy matter to get point rule overlapping a lead or a piece of card, but if the matter rocks it shows at once that it is not solid and must be seen to; if not, the forme springs on machine.

Wear of Type in Cylinder Printing.—Mr. Theo. L. De Vinne has said that cylinder machines have been adjudged as very injurious to types. The noticeable wear of types on these machines is due more to the omission of making-ready than to any inherent defect in the machine. Cylindrical pressure need not, yet with careless hands it often does, grind off serifs and hairlines much quicker than pressure of platens. But types well worn can be used under cylinders longer than under platens. Letters which have been rounded on the edges to such an extent that vertical pressure cannot give a readable impression are made fairly legible when they are printed on a rotary or a type-revolving machine. This wear on types is often avoidable. A careful compositor and a skilled pressman can make types do twice the service they give under the hands of careless workmen.

Hints on Setting Pamphlet Covers.—The title for a pamphlet cover, without border, should be of plain face. Old style lower-case of roman or italic will be most satisfactory for a short title of one or two lines. For a full-

page cover-title select plain type. If a rule border is desired, select a rule which can be readily fitted with corners. Never cut a rule, nor make up a border, for a cover-title until you know what will be the exact size of the cover. When you know the size, arrange the border so that it will be equidistant on all sides from the edge and back of the cover. Always keep the border of a cover at good distance from the types of the title. Prefer borders of large pieces. Never make up a combination of small pieces without order. If a cover forme of four pages contains cuts or electrotyped advertisements of unequal size, have the four pages made up on galleys in pages of uniform size before they are laid on stone. Before making a margin, get a trimmed sheet of the cover paper. Find out from the foreman the exact thickness of the pamphlet, and make allowance for this thickness in the inner margin or back. When it can be done, put marks between the second and third pages of a cover, indicating the thickness of the book, as a guide to the coverer.

Border Sets of Rules.—In most offices there is a considerable amount of work in which rule borders of various sorts are used, which run largely to uniform sizes. The usual way is to make up one or more sets of rules in sizes which will fit for cheques, notes, postal slips, and anything else which may generally be made of uniform size—even sets of rules for book formes, if the work runs that way—each set consisting of four pieces carefully mitred. A two-point rule with a one-point face is perhaps the most useful; parallels of light and medium weights are also good. If the rule selected is bevelled on one side only the borders can be used in connection with panel designs with better results in many cases than when rule bevelled on both sides of the printing surface is used, as cross rules may be made to join the border more perfectly. Two styles are enough, ordinarily. When not in use these border sets must be tied up, labelled, and put away. If there are numerous sizes, the various sets should be so indexed and kept that no time will be lost in searching for them when needed. These border sets are not only inexpensive, but save time and add greatly to the appearance of printed matter.

Arrangement of Case Racks.—As far as possible keep them so as to have a series of faces in the same rack. By this means a larger cap will often suggest itself to make a more effective display line.

Setting Short Measures.—Say the measure is two ems brevier. Make up the stick to ten ems, drop in two four-em quads of its own body in the end of the stick farthest from you, justify up to them, and go on filling the stick; when it is full, empty it and remove the quads.

A Good Suggestion.—Always pick up a type, lead, rule, or quoin, at the time it is dropped. This is not only a saving of material, but it engenders a habit of carefulness and economy. Moreover, the stooping and bending of the body is often a relief, especially after standing erect for some time.

How to Mitre Rule Borders.—Nothing looks worse than a bad joint at the corner of a rule border, whether mitred or not, and it may not be amiss to give the rule worker a little hint how to avoid them. Having cut the rule a trifle longer than you desire the finished piece, and squared the ends on the mitreing machine, place the rule in position for the final cut, and put a piece of two-ply (100 lb.) card about two picas long under the end next the knife, and then make the cut. The effect of this is to give a slight undercut, leaving the face of the rule the longest, for it is mitred face up. With a sharp knife in the machine this method will give joints which will close up so tight as to be invisible.

Use of the Planer.—Get into the habit of laying the planer down on its side. Occasionally the face of a planer becomes slightly sticky, so that grains of sand and even small pieces of type will adhere to it if it lies on them face down. If laid on the side there is less likelihood of anything being jammed into the face of a forme when the planer is used. As an extra precaution, also, wipe the planer's face with the hand before using it. Such little things as these, costing nothing and requiring no extra time, are sure signs of a printer's proficiency.

Cleaning Formes with Steam.—Steam has the advantage of rapidly boiling the oil of the ink, which condenses; it gets rid of all dirt, and leaves the types perfectly clean. Further, types cleaned by this means always look new, and the oxidation produced by potash, which is so injurious to the skin, is avoided. Let the forme be subject to the jet of steam for two minutes. The heat will dry the types instantaneously, and much facilitate distribution. As no brushes and potash are required, the expense of fixing up the piping is very soon saved. The steam must be drawn direct from the boiler, as waste steam is not hot enough.

Washing Formes.—Formes sent down to machine ought not to be wetted too much with lye or with water, otherwise it becomes necessary to dry them before working, which takes time and often much trouble. The wet works up little by little to the face of the letter, and then the forme becomes unworkable. It has often to be taken off the coffin, the feet of the types have to be thoroughly dried, then some sheets of unsized paper have to be placed under the forme; it has also to be unlocked, shaken, locked up again, the sheets removed with the moisture they have imbibed, and then the forme will be workable. If not, there is nothing to be done but to lift it and dry it by heat. Lye is generally used for washing formes which do not contain wood blocks; turpentine where woodcuts or wood-letters are to be found in them. The bristles of the lye-brush should be longer than those of the turpentine-brush, and, in order to preserve it, each brush should be properly washed with water after using, and shaken and stood up to dry. If this is not done the brush will not last long. There is no good in taking up with the brush a large quantity of lye or turps, and shedding it at once. Yet this is too commonly done, regardless of waste. In order to wash a forme well the brush should be passed lightly over all the pages, in order to wet them uniformly. Then they should be rubbed round and round, and finally lengthwise and crosswise. Leaning on the brush not only wears away the bristles, but sometimes injures the face of the types. It is a bad practice.

A Way to square Warped Furniture.—Wood furniture is often discarded before it is worn out, because it will spring. Take a piece and try the square on it, and the reason is plain—it is not perfectly true. A quick and easy way to square up those pieces out of truth is to take a piece of coarse sand-paper and a block which is known to be square, place the sand-paper on the stone with the block held firmly in the left hand. With the other hand push backwards and forwards the piece of furniture to be made true on the sand-paper, at the same time holding it against the block held in the left hand. This will reduce the width of the furniture from the point size (if it ever was absolutely correct), but there are many places where this will not make any difference.

Compositors' Requisites.—Every jobbing hand should possess a gauge, one up to 100 ems, and a sheet containing the sizes in inches of the various folds of paper, so that on receiving instructions to set a job he would not be at a loss for some idea of the size. It is in the seemingly unimportant items where valuable time is lost.

Tweezers.—These are very handy, and every compositor should own a pair. But do not use them as an aid in correcting straight matter. A composing-rule and the fingers are the only tools necessary for that. Tweezers are intended as a help in correcting tabular matter, and are seldom needed elsewhere. When you see a printer using tweezers in straight matter corrections you may be sure he has never fully learned his trade.

Composing Room Tools.—It is astonishing to go into some large printing establishments and find therein a woeful disregard of modern improvements. For instance, in most houses there is generally a "ship" exclusively for small jobbing, but here one often finds the imposing surface, mallet, planer, and shooter just as large as in a "ship" doing heavier work. Probably some will say that a large imposing surface is useful for an emergency. This may be so, but there is no earthly reason to use a mallet and planer of the ordinary size on delicate cards, etc. Overseers of composing rooms should issue to their clickers

mallets and planers about one-third the size. They are much handier, just as effective, and the compositor can better feel whether he is injuring the type or not with proper tools.

Mallet, Shooter, and Quoin.—No end of time is wasted in perpetually having to take these useful articles out of a drawer whenever they are wanted. The proper place should be at one end of the surface, and that divided off into two portions—one-third for the mallet and shooter, and two-thirds for the quoins; by so doing they are always at hand. If there is any objection as to its being in the way, an arrangement might be effected where this shelf could be slid under the surface whilst any correction was being made. The whole side arrangement need not be more than six inches in width.

The Care of Brass Rule.—It is not sufficient that brass rule be given the perfunctory washing with lye or benzine usually accorded to small job formes. After the forme is distributed, the rule which has been used in it should be gone over carefully with a rag dampened with benzine, to remove the particles of ink and dirt so apt to accumulate at the height of the shoulder made by the junction of the rule and adjoining quads, leads, and furniture. Dried ink on the sides of any fount of brass rule is objectionable, but when found on rule depending for perfect joining on square corners and flush sides it is fatal to good results.

Twisting Brass Rule.—Work and designing in brass rule are now the most popular means of ornamentation, and a few practical hints may be helpful. One may soon learn to bend leads by heating them; moreover, brass rules, even as heavy as nonpareil, can be easily bent after heating and allowing to cool. The rule must not get too hot, or it will melt; keep watch on it and remove it from the fire before reaching white heat. Circles, ovals, curves, and flourishes may thus be easily made at pleasure; and even letters for initials, very neat and unique in appearance, may be produced with only a file, a vice, and a hammer for tools. For most rule-work ten-to-pica rule will be

found cheaper and easier managed than the heavier rules. When it is desirable to bend the corners of a rule up or down, time and trouble in justifying may be saved by cutting the rule parallel with the face, and just above the top of leads used, the desired space, and bending it in any direction desired. This is recommended for short bends only, though with heavier rules it will work for a longer space. A pair of pincers will be found very useful in doing rule-work. Remember, that a good artistic worker in rule ornamentation can make a success, and command good prices, while a poor workman cannot do as well as a plain workman—that is, he cannot obtain as good prices in proportion to time spent as the plain workman. But only those who have tact, genius, and a love for this style of ornamentation, will make a true success of it, either for pleasure or profit. To do successful work it is necessary to have good material and good tools to work with, and then after the design is finished it is essential that good ink be used, and great care be taken in press work to bring out the effect in the printing.

The Care of Twisted Rule.—When this has been used for ornamentation, and is turned out in distribution, it should be placed in a conspicuous position for future use, and not planted or hidden by the person who happened to "twist" it in the first instance. Where this "planting" practice is allowed it must necessarily result in a much greater amount of rule being bent than need be for the requirements of the office.

Setting-up and Working Numbers.—Suppose five sets of numbers from 1 to 100 are required, first set up the ten digits in a column and print 240 copies to the right of the centre of the sheet. Then shift the sheet on the press so as to print ten copies of the same column side by side with the first; this makes 11, 22, 33, etc. Now remove the cipher from the bottom and place it at the top, so that the column reads 01, 12, 23, etc. The 9 is now put at the head of the column causing it to read 91, 02, 13, etc. One by one the figures are transposed from the bottom to the top, the last column reading 21, 32, 43, etc., of which, as

with the others, print ten copies. Then set up ten 1's, and print them on five of each of the forms already done, except the first, and also changing the lower 1 to a 2 on the column ending with 00. This, it will be seen, gives us all the numbers from 1 to 200. The operation is illustrated by the following table, showing the successive printings. Bear in mind that the left-hand column (1 to 0) is printed on all at the first running through of the press:

1	11	01	91	81	71	61	51	41	31	21
2	22	12	02	92	82	72	62	52	42	32
3	33	23	13	03	93	83	73	63	53	43
4	44	34	24	14	04	94	84	74	64	54
5	55	45	35	25	15	05	95	85	75	65
6	66	56	46	36	26	16	06	96	86	76
7	77	67	57	47	37	27	17	07	97	87
8	88	78	68	58	48	38	28	18	08	98
9	99	89	79	69	59	49	39	29	19	09
0	00	90	80	70	60	50	40	30	20	10

It will be seen that but twelve forms (including the 1's) will be required for this work, while much less time will be spent in making changes than would be occupied in endeavouring to print after the old method. Of course, if the numbers and changes run above 200, it will only require a greater number to be printed on each form, with the corresponding addition of higher numbers for the hundreds.

Standing Formes.—In almost every office of any importance there are hundreds, and perhaps thousands, of formes standing. Some of them, probably, are only used once a year, nevertheless they are allowed to stand there until wanted again. The method is considerably on the increase, and overseers would be acting wisely to overhaul the list of standing formes thoroughly. How often may the men be noticed going from one drawer to another for quoins, etc., which, by a judicious working of the standing formes, would release enough material in the shape of quoins, furniture, side- and footsticks, and chases, to supply a good many men for days.

A Suggestion for Spaces.—Keep your middle and thin spaces separate. It is no uncommon occurrence to wade through a box of mixed spaces to get half a dozen thins, whereas, if kept separate, they could be obtained at once. It is just as ridiculous to mix them as it would be to mix the lower-case t's and a's, and expect to know the difference by their thickness in using them. If the case maker would arrange the case with another box for thin spaces—say by taking about one-third of the upper end of the lower-case e box, on the nearest side to the middle space box—the practice of mixing thin and middle spaces would soon die out.

Chases for Imposition.—Chases should not only be plentiful, but of the best finish—that is, the inside exactly true—for the class of work done to-day demands this. What is worse than to find a good job, with perhaps a rule or other border, when locked up anything but straight? With a square and a little patience, of course this can be remedied; but is it not far better to remove the cause? Many chases made at the present time are not firm enough. A place for everything and everything in its place, is a golden rule for the composing-room. Many employers are penny wise and pound foolish. It is very annoying, after a a man has done his best to execute a job in good time, to find on coming to impose the forme that there is no chase; he must search for one. He finds a forme at last, the overseer gives permission to drop, and he is expected to unlock, tie-up the matter, clear off the surface, before commencing to lock-up his forme. Instead of allowing each and every individual to drop for chases, would it not be more profitable if a man were deputed to drop, hand over matter for distribution to the person who gives it out, and thus always keep a number of chases in the rack ready?

The Value of Good Chases.—A well-made true chase is absolutely necessary for good printing, and will save much worry, and in the long run much money. A roughly-made chase, welded in the corners, the lumpiness of its inside surfaces merely scratched down with a coarse file without reference to smoothness or squareness, is a very

expensive article in a printing office, even though it cost nothing at all. It throws type off its feet, so that it looks badly in print and wears out rapidly. It is extremely liable to pie formes, and one pied forme costs more than two good formes. A poor chase just as it comes from the forge will cost less than one finished by the most perfect machinery; but a fine machine-finished chase will cost a great deal less than one finished by hand, and have a uniformity the hand-finish cannot approach. Like almost all kinds of printers' machinery, the best is the cheapest.

To Preserve Wood-Letter and Cuts.—To prevent warping in blocks and wood-letter used in large bills, they should be placed in a zinc basin, provided with an air-tight lid, and then thoroughly saturated with paraffin oil; after being left thus for about four days they should be wiped with a clean, dry rag. Prepared in this way, when new, wood-letter is stated to resist the effects of lye, petroleum, turpentine, and atmospheric changes.

Another Method of Preserving Wood-Letter.—It is generally believed that oiling the face of new wood letters, or even of woodcuts, will make them take the ink better, besides giving them greater durability. But in the first case the result has not always been favourable. A foreign machine-minder has found a means of obtaining the desired effect, without risk of making the types or cuts too greasy. He pours some oil on the imposing stone, or, better still, on an iron slab, and spreads it with the finger on a space the size of the wood letter or cut to be oiled. Putting the cut then, face upwards, on the oiled spot, in a very short time the oil is entirely absorbed, and the letter or cut is permeated so entirely as to protect the finest lines of its face.

Repairing Battered Wood Type.—A writer gives the following: The last office I worked in was stocked with battered wood type, of course caused by careless handling on the press; broken tapes, dirt, and an occasional falling out of one of the feed guides on to the forme while in motion had caused the trouble, and it was impossible to

do good work with such an outfit. I tried filling up the depressions with sawdust and glue, beeswax, etc., but the result was not satisfactory. Determined to conquer the difficulty, I mixed some warm glue with Spanish whiting, and, after cleaning out the depressions well, and in some instances deepening them in order to give the preparation a good chance to hold, I plastered the defects over with the mixture while warm and put sufficient on to fill all depressions thoroughly, not being careful to get a smooth surface. After it became hard I filed it down close to the letter, avoiding scratching the even surface of the letter, and then treated it to a good rubbing on an oil-stone, using oil, and the result was a polished surface as good as, if not superior to, the wood itself; and, as I rubbed down the plaster even with the surface of the letter, the printing failed to show any defects whatever: even the planer did not damage it.

How to Treat Wood Type.—To prevent warping, all very large wood type should be set up on edge when put away, so that both sides may be equally exposed to the air. In cleaning it, neither lye nor water should be employed under any circumstances. Turpentine, paraffin, benzine, or kerosene oil may be used; but turpentine and paraffin are the best. Procure a small shallow pan; lay the forme flat on the board; pour about six table-spoonfuls of turpentine into the pan; lightly dip the face of the brush in the turpentine, and pass it quickly over the forme before it evaporates. Six or eight spoonfuls of fluid will be found sufficient to clean a large forme, if thus used.

Easy Method of Cutting Wood Letters.—A continental printer manufactures wood type by a very simple process. He sticks the printed type he wishes to cut out on a thin slice of wood, or draws it on with a pencil, using a cork-saw to cut out the shape of the type, even out of several wood-slices at once, putting one upon the other, afterwards fastening the type on a solid block of wood corresponding with its size. The finishing touch, to do away with any roughness, is given with the graver, penknife, or rasp.

The Need for Sufficient Racks and Frames.—Much of the work in printing offices is done at a disadvantage, on account of the short-sighted policy of the proprietors, who cannot or will not see the benefits of proper conveniences for disposing of matter and material. Galleys of matter on the cases are a very common annoyance, which can be cheaply remedied by the purchase of galley racks, which become permanent fixtures in the office. Putting two or three founts of job type in one case is poor policy. The price of a few cases is saved, but the amount is soon lost in the time it takes to set lines out of such collections. In the same offices there is usually a lack of frames, so that compositors are in each other's way, and work at a great loss. Much better it would be to purchase another stand and cases, which would furnish room for the type and add greatly to the economical working of the compositors by the additional frame to work on.

Keeping Cases Clean.—Dust is a great foe to types, as well as to the comfort of the compositors. No sane person would think of throwing sand upon a forme to be ground into the types. Yet the damage is proportionately as great when cases and types in constant use are allowed to accumulate dust to be ground against the faces of the types when shaking them up, the jarring consequent upon the continual touching of the fingers in the case in composition, and the repeated friction which comes from use. It is a matter of economy to have cases blown out at least once a week, and piece hands will make money by keeping their cases free from dust by the increased amount of work they will be enabled to do.

Clearing away Leads.—In distributing leave the leads and slugs to the last, and make one job of it. Take a long galley, jog up the leads as they come on the galley, then pick out the longest, next longest, and continue until the smallest is reached, packing the assorted leads at one end of the galley. Carry the galley to lead rack, and in a few minutes the job will be done, while if done by the haphazard plan which nine out of ten compositors use, much time would be lost.

Sticky Type.—It is said that types, especially new ones which have been papered up and put away for a long time, and which consequently stick badly, may easily be separated by placing them on the stone and pouring a little glycerine upon them, leaving them to stand there over night. The glycerine may be washed away with warm water, when the types will be found ready for distribution.

Another Remedy for Sticky Type.—The type in long standing jobs often becomes firmly cemented together and [illegible] with dirt, and resists strongly all ordinary attempts to separate it. Pour lard oil over the face of the type, rubbing it in thoroughly with a soft rag; then wash in strong lye with a brush and cleanse with hot water, and every type will be found loose and clean.

Another Remedy for Sticky Type.—A printer writes that he has experienced great annoyance in this. After trying every plan suggested, with but little relief, as an experiment the foreman lifted a column of matter to a galley, and, after slightly locking it, took the benzine can and ejected benzine upon the face of the matter, then with fingers and thumbs worked the type to and fro slightly, but thoroughly. After standing a little while the matter was thoroughly saturated, and the caking of the type was found to be cured. If this experience is worth anything to the sore-fingered and discouraged distributor of new type, the object of this paragraph is accomplished.

A New Rule-Cutter has been invented to replace the ordinary rule-cutting machine. It is adapted for cutting brass and metal rules of all thicknesses, as well as reglets, side-sticks, etc., and can also be used for trimming stereotype plates. The article to be cut is firmly held in position by the aid of a strong lever, while a saw working in a groove, and so mounted as always to cut at a true right angle, performs the cutting operation. When in use the teeth of the saw require repeated oiling with a brush, and the invention is said to give great satisfaction with the expenditure of little effort. The cut is claimed to be sharp and clean, and in the case of brass rules not to need further finishing.

Style in the Reading Closet.—We all know that printers' readers are a very much abused class of men. To some extent, when they are not practical men, they deserve some of the remarks made concerning them. One of the commonest of readers' troubles is "style"; a good many readers do not seem to have grasped this important item at all. The head reader should draw up a list of rules, and a copy should be given to each compositor. Such a list could be kept standing and added to as required.

Average Measures for Bookwork.

Size.	The Page of Type should measure in Pica Ems.		Size.	The Page of Type should measure in Pica Ems.	
	Length.	Width.		Length.	Width.
Foolscap.			*Demy.*		
4to ...	41	30	4to ...	54	42
8vo...	32	18	8vo...	42	24
12mo	28	15	12mo	36	19
16mo	19	15	16mo	26	20
			32mo	21	12
Crown.			*Royal.*		
4to ...	48	34	4to ...	64	48
8vo...	36	21	8vo...	48	27
12mo	32	16	12mo	40	21
16mo	23	16	16mo	29	21
			32mo	24	14

Special Sorts.—Where do they all go to—such as fractions, reference marks, accents, italics, etc.? Every employer who has had much book or news work which called for any quantity of these sorts, has had the problem put sharply to him by the frequent demand for fresh supplies. On inquiry, he has traced their disappearance to the laziness—it is nothing more nor less—of some compositors, who, not thinking that these sorts are likely in an emergency to be very valuable, either throw them into the quad-box, or scatter them promiscuously and recklessly about the upper case.

A Square Inch of Type.—It is not always, when asked for an estimate, that the printer has at hand the means of making it. He has mislaid his graduated scale, or the matter to be cast off is in awkward batches. A ready method, however, is suggested. It has been calculated that a square inch of pica contains 36 ems; of small pica, 49 ems; long primer, 56 ems; brevier, 86 ems; minion, 100 ems; nonpareil, 144 ems; and ruby, 196 ems. Any fractions in the calculations are in favour of the printer.

Suggestion for Galley-Proofs.—See that they all are upon full-sized slips, no matter whether one galley is a short one or not. If submitted on a short slip, this is the one which is generally lost.

Useful Hint in Pulling Galley-Proofs.—Many compositors have a way of bringing up the spaces when proofing a galley. This can be overcome, even when using the keenest roller, by rolling the galley diagonally, and giving the roller a gentle twist in passing over the type.

Receptacle for Battered Letters.—Every compositor should keep by him, convenient to his right hand, receptacles for battered letters and for wrong founts, and on no account should he throw either into the quad-box, or into some spare box in the upper case. Where the latter plan is adopted, very frequently it turns out that comparatively scarce letters are thrown into it; whereas were they placed as here suggested, and distributed, say, once a week, much untidiness would be prevented, and the type would all the sooner be brought into use again. There is as much type carelessly hidden away in the quad-boxes of some printing offices as would fit up a small newspaper and jobbing office combined.

Lifts and Formes.—In large houses the composing and machine rooms represent the two extremes of the building, therefore the formes have to be sent down in the lift. No provision whatever is made in the lift for the protection of the type; consequently, it is a frequent occurrence to see the compositor running downstairs to repair a battered forme. Just the same thing happens again when the formes

are worked off; the man who takes them out of the lift lays them where he can find room, and if no one happens to be looking he is not particular whether the faces are together or not, and small blame to him, as such things ought not to be left at his discretion. A cheap and lasting way out of the difficulty would be to procure, say, fifty demy stout straw boards, and then give instructions that no forme is to be put anywhere without one of these boards. The remedy is simple, and does away with the use of many a quoin, which, after all, is liable to slip almost at any moment from a set of formes.

Display Founts.—Keep these types in double cases, *with spaces and quads.* Two founts of any one size may generally be kept thus, and there is then no need to go to a fresh case, perhaps in a different part of the office, to space out, or to get rid of the spaces in distributing.

Scarce Founts.—It is a good plan, when putting away standing formes for any length of time, to "lift" the lines set up in type of which there is likely to be a scarcity, and re-lock up.

Picking Sorts from Standing Matter.—If this is absolutely necessary, never leave a forme with a single letter taken out without "turning" for it. It frequently happens that a standing job gets worked off from a forme which has been picked by some careless workman, whereas, had he done as suggested, the faulty line would have presented itself on the first impression being taken, when matters might have been remedied.

Lock-up for Galleys.—A cheap, effective end-lock is a piece of flexible steel, lead high, bent between side of galley and side-stick. This can be used quickly, and is effective on any size galley.

Scarce Hair Spaces.—If the demand for these is greater than the supply, a run round the display founts will generally produce the desired result. They are often dropped with the letters in distributing, because they have a tendency to stick to the letters.

Remedy for Broken Rule Joints.—During the last few years the brass rule and panel-work style of job printing has come somewhat into fashion, and no other style of composition has had such success. It seems to be adapted to various classes of work, and from present indications there seem to be no signs of abating. But it is disappointing to a printer to see a piece of composition with heavy rules around and each corner wide open, showing where they have not joined together. This is of frequent occurrence, and what would have been a good job is spoiled. It is easy enough to close the ordinary brass rules such as 1- and 2-point, but when it comes to 6- or 12-point the opening invariably is visible on printing. Soft solder or wax consume a large amount of time in closing the rules, but the trouble may be overcome in the following manner: Before locking-up the forme, spread the rules far enough apart to insert pieces of ordinary 40-lb. book paper, cut large enough to extend slightly above and on each side of the rules. Before inserting, the paper should be slightly rubbed on each side with flour paste. Close the rules tightly, lock up the forme and plane down. Then with a sharp knife cut away all surplus paper remaining around the rules. In this way openings in the rules will be completely closed, the forme may be washed out as often as desired, and in the longest run the joints will not break away.

New Composing Stick and Rule Cutter.—An American compositor has invented an ingenious improvement. This improvement consists of a gauge, designed for both stick and cutter, by which either can be instantly and accurately set to any desired number of ems, pica or nonpareil, without the use of leads, rules, or quads. The cutter has along one edge a row of grooves, a pica em apart, which engage the lugs on the gauge. The cut is a sheer cut from the front, preventing slipping, and the lengths absolutely accurate. The stick sets with a thumbscrew, reversing to half measure, and marks indicate the length set to. There is no necessity to gauge with rules; on the other hand, the correctness of rules or leads may be tested with the stick.

Borders.—To be agreeable these need not surround a page if it presents a more agreeable effect when run upon two sides only. Still, the idea of uniformity and perfect balancing of parts is followed so tenaciously by many printers that they seem to find it impossible to use borders and parts of designs decoratively. The Germans particularly adhere to the exact and ponderous style, and while their work is, in many instances, exceedingly beautiful, it is quite as frequently so heavy as to be displeasing. The happy medium between the two extremes of excessive ornament and meaningless and insufficient ornament is one which only practice and observation will teach.

A Method of Type Music Printing.—Set up the staves in brass rule and work them first, then by means of special music types set up the musical notes, rests, bars, and other signs. These are all set to gauge, and then the forme is printed off on the sheets already bearing the staves, the only requisite being accurate register. By this system music may be printed in several keys from the same forme of type, all that is needful being to remove one or more leads from the bottom of the page to the top, or *vice versa*.

Preservation of Type-Cases.—To protect type-cases and boards against the influences of damp, German manufacturers of such are treating the different parts of them with hot oil, impregnating them thoroughly before putting them together. They will never warp after having undergone this treatment.

Overrunning Type in Corrections.—Some compositors in correcting do not overrun the matter in the stick as they ought to do, but on the stone, and frequently hair-space or treble-space a line, in order to get in or drive out a word; when by overrunning a line or two forward or backward they might preserve uniformity.

The Setting of Half-Measures.—Matter set to two measures can, with a little practice, be just as easily managed by scraping a line on the setting-rule with a bodkin, and spacing to the engraved line, as by using a clump or lead as a "jigger." To make this clear, suppose you have first

column 12 ems and remainder 14—26 in all. Mark your rule 12 ems from the front, and, in setting, space out to line engraved, then complete the line (the remaining 14 ems) in the usual way. Of course, if the columns are to be divided by rules, it will be safer to adopt the old method of using a "jigger," but if not, the foregoing plan will be found quite satisfactory, especially after a little practice.

Poster Founts.—Where bill type is kept in open cases or trays, difficulty is often found in stowing away large founts or expanded ones, as they take more than one case. If the racks are arranged side by side, then the heavier founts can be placed in trays in two or more racks parallel with each other, and each drawn out while getting or distributing a line, which is much better than having them underneath each other, for obvious reasons.

The Making of Posters in Country Offices.—An important question in the small country office is, "What shall I do with the order for a job of printing which is seemingly above the limit of my office?" While it is true that the average country printer is often handicapped by the absence of proper facilities, yet too often the office is hampered more by lack of ingenuity on the part of the printer, rather than by any lack of material. The particular point to bring out is the printing of two- or three-colour posters. Few printers outside the medium-sized cities would attempt to print a 24 by 36 two- or three-colour poster. And yet there are but few offices in the country so poorly equipped that this work cannot be done. A hand press, a few founts of fair-sized wood or metal type, and ten feet of inexpensive wood border. The prominent lines and headings are carved upon blocks of wood of the proper size and thickness. The best wood to use is poplar, as it is easily worked. This can be procured at any planing mill. The board should be planed down perfectly flat and smooth and type-high. The design should be drawn on the reverse of the block with a soft lead-pencil. Fasten the block securely to a bench or table, and with a sharp knife or chisel cut out the parts not wanted. The work will be easier if you have a set of carving tools.

Abstract of the London Society of Compositors' Book Scale of 1901.

	Size of Type.		Common.	Foreign.	Dictionaries. English.	Dictionaries. English.	Dictionaries. Foreign.	English Grammars.	Foreign Grammars.	Catalogues. Library.	Catalogues. Booksellers'.	Catalogues. Auctioneers'.	Greek. Without Accents.	Greek. With Accents.
			d.	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*
Manuscript.	English to Brevier	*leaded*	7¼	8¼	8¼	8¾	9¼	8¼	8¾	7¾	8¾	7½	10	11½
		solid	8	9	9	9½	10	9	9½	8½	9½	8	10¾	12¼
	Minion ...	*leaded*	7½	8¾	8½	9	9½	8½	9	8	9	7¾		
		solid	8¼	9½	9¼	9¾	10¼	9¼	9¾	8¾	9¾	8¼		
	Nonpareil	*leaded*	8¼	9½	9¼	9¾	10¼	9¼	9¾	8¾	9¾	8½		
		solid	9	10¼	10	10½	11	10	10½	9½	10½	9		
	Ruby	*leaded*	8¾	10	9¾	10¼	10¾	9¾	10¼	9¼	10¼	9		
		solid	9½	10¾	10½	11	11½	10½	11	10	11	9½		
	Pearl......	*leaded*	9¼	10½	10¼	10¾	11¼	10¼	10¾	9¾	10¾	9½		
		solid	10	11¼	11	11½	12	11	11½	10½	11½	10		
	Diamond	*leaded*	11¼	12½	12¼	12¾	13¼	12¼	12¾	11¾	12¾	11½		
		solid	12	13¼	13	13½	14	13	13½	12½	13½	12		
Reprint.	English to Brevier	*leaded*	6½	7½	7½	8	8½	7½	8	7	8	6¾	9¼	10¾
		solid	7¼	8¼	8¼	8¾	9¼	8¼	8¾	7¾	8¾	7¼	10	11½
	Minion ...	*leaded*	6¾	8	7¾	8¼	8¾	7¾	8¼	7¼	8¼	7		
		solid	7½	8¾	8½	9	9½	8½	9	8	9	7½		
	Nonpareil	*leaded*	7½	8¾	8½	9	9½	8½	9	8	9	7¾		
		solid	8¼	9½	9¼	9¾	10¼	9¼	9¾	8¾	9¾	8¼		
	Ruby	*leaded*	8	9¼	9	9½	10	9	9½	8½	9½	8¼		
		solid	8¾	10	9¾	10¼	10¾	9¾	10¼	9¼	10¼	8¾		
	Pearl......	*leaded*	8½	9¾	9½	10	10½	9½	10	9	10	8¾		
		solid	9¼	10½	10¼	10¾	11¼	10¼	10¾	9¾	10¾	9¼		
	Diamond...	*leaded*	10½	11¾	11½	12	12½	11½	12	11	12	10¾		
		solid	11¼	12½	12¼	12¾	13¼	12¼	12¾	11¾	12¾	11¼		

Reprints not in every [illegible] the originals, are cast up ¼*d.* per 1000 extra; Reprints with M[illegible]
Stereotyped matter [illegible] per 1000 extra; Stereotyped matter with low spaces is cast u[illegible]
Thin founts are cast up ¼*d.* per 1000 extra for every en below 12 ems of their own body.
Bastard founts of one remove are cast up to the depth and width of the two founts.

Material placed Conveniently.—An analysis of the work which comes from the composing-room will show what series of type are most used. Such series should be placed at the most convenient height for access in the racks or cabinets, and thus avoid much stooping over and stopping work to place cases at a convenient height to use. It is always a good rule to place the most used articles in the most convenient places.

Oblong or Upright?—It ought to be a composing-room rule that figures showing the size of the paper for a job should also show the direction the type-lines are to run. Thus, if the lines should run the five-and-a-half-inch way of the paper, write the size $5\frac{1}{2} \times 8\frac{1}{2}$ in.; if they should run the long way, write it $8\frac{1}{2} \times 5\frac{1}{2}$ in. The adoption of this simple rule will save a lot of time.

Cutting Reglet and Furniture.—Never cut up short pieces to make shorter ones. This leads to great waste. But when a piece of the required length cannot be found, cut one off a new length and put it away carefully in its order. If this plan is followed, in a short time there will be plenty of pieces of all lengths without resorting to the saw, while by the other plan one may be continually cutting and never have an adequate supply.

Border Cases.—Keep these "up," on frames handy to every compositor, and not, as is frequently the case, on some one compositor's frame—both in his own way and not at all get-at-able by the other members of the staff.

Distribution Galleys.—Do not distribute matter from mahogany galleys, but lift on metal galleys before wetting the matter. Galleys are soon ruined by carelessness in regard to this. At the same time do not damp the type on the frame.

Locking up Formes for the Foundry.—Great annoyance and danger are often experienced in electrotyping from formes which have not been properly locked up. A proof taken from a forme after the quoins have been pushed up with the fingers may show every line straight and everything in its proper place, when, after finishing the lock-up,

the tightening of the quoins with the mallet and shooting-stick or wrench will produce displacement of lines and types alike provoking and unsafe. Formes for electrotyping should be locked up even more tightly than when sent to press; for the adhesiveness of the wax mould is more likely to draw letters than the suction of rollers. The forme should be well planed down after the final locking up—care being taken that no dirt or other extraneous substance is under it—to ensure its being perfectly flat. A proof of every forme should be taken after the final lock-up, and this proof carefully examined to see that nothing has been dropped or displaced. A clean proof should be sent with the forme to the foundry, that the electrotyper may have an opportunity to examine it, and to repair any damage which may happen to the forme while in his hands. Before locking up a forme, type-high bearers at least a pica in width should be placed around it, and between (and close to) the several pages, if there are more than one. Open spaces, as about headings, blank pages, etc., should also have bearers made by placing types in blank spaces. These bearers serve the double purpose of guards for the matter in the formes, and enable the workman to have something to rest the plate upon when finishing them.

The Making-up of Two-Colour Formes.—Set up the job, lock up, and pull a couple of impressions. On one of the impressions mark out what is intended for red, and use the other one for making-up the colour forme in this manner: Lay the sheet face downwards and rub the back with a piece of waste or other material well soaked in machine oil. Lay a sheet of white paper on the surface, and upon this face downwards lay the oiled one, when the lines of the job will be plainly seen, and all that one has to do is to lay the lines of type intended for red on its own impression, and invariably perfect register will be the result. This idea for very small work would, in many cases, be a waste of time, but for intricate work it will be found advantageous. Small work up to octavo is easily made up on the galley side by side. For instance, say an octavo is now on galley, place a lead or clump down side and put the red lines dead opposite where lifted from. This is an ideal

way of getting register. Many lay down two-colour work with the aid of a folded impression, and frequently at a great loss, for where there are several colour lines the sheet has to be lifted and laid on the type again and again before the compositor is satisfied. Not only this, but the register is very often bad. In ordinary handbill work a folded sheet would be advantageous, for generally it is merely line-for-line colour work. When the formes are made up, and one wishes to test register before sending to machine, the following will be found to answer: Pull an impression of the two formes, oil the one from the key forme and lay on the other, when the job will be plainly seen in its entirety, without having to hold up to the light. If it is found that it is still out of register, all that is required is an alteration of the colour forme, another impression pulled, the oiled sheet laid on again and again until perfect register is assured.

A Mount for Illustrations.—An excellent imitation frame for a picture may be made in the following way: First take an old electrotype block and paste a piece of very coarse sand-paper upon it. After it is entirely dry take a ruler and sharp penknife and trim the sand-paper to the size desired. Then lock the block in a chase, and after taking the rollers out of the press and preparing the tympan take a brush full of paste and daub the tympan thoroughly where the block would come in contact with it. Then lay over the tympan a sheet of soft book paper, then daub it with paste again and lay on top of that another piece of soft paper. Then take an impression upon the tympan and allow the press to remain so for about half an hour, when the guides may be set and the job run off very quickly. Cardboard can be treated in the same manner. Some very good effects can be obtained by using plates made from book-cloth in place of sand-paper. The reader will find that it is a great advantage to be able to make his own "Rufenuf" (rough-enough) papers and cards, as he can do his printing first and then emboss his job afterwards, thus avoiding the trouble of trying to do a decent job of presswork upon the rough-surfaced papers and cards furnished by the paper-dealer.

Blocks for Tinted Grounds.—These may be made of various materials, such as brass, type-metal, box or other wood, celluloid, etc. The way some printers help themselves may, therefore, be read with advantage. They take a very smooth and even glazed board, and cut two or three pieces out of it, a little larger than the desired tint block. A similar piece is cut out of pasteboard, well sized and smooth, and the whole is formed into a layer with best glue, and then glued down on to a solid wooden board—oak will suit best—so as to form a type-high block. This done, the block is put into a small press, or one may simply put boards and heavy weights on it, just to let it dry under severe pressure, care being taken that the pasteboards are well united to each other and to the wooden block, as the result depends on it. When completely dry, the transfer may be made. The forme to which the tint block is to fit is locked up in a frame, as also is the block itself, the latter being disposed so as to fit in the composed matter as exactly as possible. Then this last one is lifted into the press or machine, and, after being well inked, one pull is made from it on to a sheet fixed on the tympan or cylinder. This done, the formes are changed, the block forme taking the place of the composition forme, after a sheet of thin pasteboard has been put on the bed of the press, to raise the block a little above type height to give more effect to the pull. The tympan, still bearing the impressed sheet, being now brought down and a pull taken, a negative copy of the contents of the forme will be obtained on the glazed-board block, the cutting of which may now be proceeded with. That operation is best effected with a thin penknife, or small chisel, care being taken to cut in an outward slanting direction, to give the printing surface of the block a larger and stronger base. When finished, the block is ready for printing; but should the number of copies to be printed from it be large, it is better to give it first a coating of varnish. A coating of shellac, diluted in alcohol, applied twice, has proved most effective, and will stand the printing of 10,000 copies. In cleaning, lye must be avoided, and only a little turpentine rubbed over with a smooth rag. When the tinted ground is to show a pattern, this may be obtained by sticking embossed paper on it,

taking care to fill the indentations of the paper well with stiff glue, and to paste it thus on the block. When dry, it may be varnished and printed from as before stated.

METAL TINT BLOCKS.—Blocks of type-metal are often used in printing tinted grounds, but prove dangerous to fine and delicate-coloured hues, as dirt may be on the surface without being visible to the eye. To keep them perfectly clean is therefore a strict necessity, and that is best arrived at by sprinkling them with benzine and wiping it very smoothly off with a soft bit of rag. Hard rubbing entirely to be avoided, as it will immediately soil the metal-blocks.

PATENT-LEATHER TINT BLOCKS are said to produce most excellent results in letterpress printing. It must be explained, however, that patent-leather is meant and not leather that is somebody's patent. Patent-leather, a sort of canvas with a varnished leather face to it, is over here known as American cloth. Use the best and thickest which can be obtained and glue a piece rather larger than the size of the tint block required to a wooden background: squeeze out air bubbles and keep under pressure until set. Trim down the leather to the required size, and the tint block, which is almost everlasting and gives results beautifully clear and uniform, is complete.

A METHOD OF MAKING BLOCKS FOR TINTED PATTERNS.—This has been patented by a German machine-minder. He uses all sorts of textile matter, preferably linen or cotton damask, with woven-in flowers or other figures, and begins by putting them in a bath of tannin and spirits of wine for twelve hours. Then it is inserted in a frame which may be extended by means of screws and wedges equidistantly, to open somewhat the space between the threads; then the frame with the matter is put in a drying-chest, and exposed to a heat of 20 to 25° Celsius. An hour later the heat is raised to 50° C., and molten beeswax is spread on the textile matter, which is still left for a space of about nine hours and at a heat of 70° C. in the drying-chest. Then the third process is come to. A solution of resin of damar in turpentine is spread over the

textiles; after remaining again for two hours in the chest, that process is repeated, and the drying continued from two to three hours. Now it is ready for printing, and may either be stuck by a strong glue on a basis of type-metal, or nailed on a wooden block. Such plates may be prepared nearly to any size, print much easier than large plates of metal, and last for very long numbers. If desirable to show wording on them, it may be done by cutting the types out of strong paper and pasting them on the printing cylinder after having finished the making-ready. The power of the printing will then be stronger on those parts, and the parts of the paper met by the extra pressure will, of course, appear some shades darker than the other parts of the tint-plate.

Cork Tint Blocks.—Cork makes an excellent tint, cut in thin strips and mounted on block, worked over light background, and bronzed with gold, copper, maroon or fire bronze. The small punctures which are found in cork, when printed in this way, produce a very odd and unique appearance. Very nice for cards, folders, or run across corners, etc.

Emergency Tints.—It is said by a writer that in the absence of the proper colours for a job wanted quickly, he has found the artists' oil colours (retailed at stationers' shops in collapsible tubes) to answer excellently mixed with transparent tinting ink. He says "they work up well, print clean, and look fresh and bright."

Style of the House.—In large establishments it is best to print a few rules as to the method of doing certain things, as nothing causes so much friction between the reading and composing departments as a want of understanding in these matters. Peculiarities in pointing, spellings, and style are not always agreeable in different offices, and a variety of styles is perplexing to all concerned, and entails much labour both on readers and compositors.

Taste in Typography.—Though the word "taste" scarcely admits of the idea of variety of style, whether good or bad, it is pretty generally so understood. The proper use of it is to denote the sensation produced on

the tongue as to distinguishing flavours. Figuratively, we may use the term in perceiving agreeable sounds, colour, or forms. In this sense a printer ought to try to educate himself to a high degree of excellence in discerning not only what is agreeable to his own eye, but to that of others. In other words, he should be able to appreciate a variety of tastes. The artist, whether he be a painter, photographer, or a printer, who can see beauty only in one style of art, or the musician who is always humming the same tune, can satisfy but few except himself. There may be but one perfect style of beauty in each department, and it may be possible for a man to attain to it, but it is certain that many more whose tastes may have had some cultivation are still unable to appreciate it. A printer, therefore, while he should strive to elevate his art by educating his customers up to his standard, should not seek to go so far above that they cannot follow.

A Hint to the Compositor.—To excel, the printer must study the best specimens of work which he can obtain. Careful study of a pleasing and attractive piece of work will often be more valuable as a lesson in correct composition than hours of experiment. To a discerning and ambitious workman a careful analysis of a tasteful piece of composition will suggest ideas which will urge an ordinary compositor to become a proficient and superior workman.

Words of Advice.—A printer, like an artist, must be born and not made. There must be a combination of natural skill, good taste, and a special love of the art to produce the artistic printer. There are men who have a decided liking for the business, but no genius in that direction. They never do very bad or very good work. They are painstaking, observing, careful in their work, but never get above the mediocre. They admit to themselves, if to no one else, that they are not a success in their chosen trade. They are forced to acknowledge that there is something in the shape of a natural gift which they lack, and for the want of which nothing else can compensate them. It is nevertheless true that a good deal can be done by cultivation and earnest study.

Bodkins.—The utility of these little instruments is undoubted, and, in the hand of a capable workman, effect a great saving of time, though manufacturers perpetrate one great fault in making them, and that is they are too long and badly finished; seventy-five per cent. break after a very brief use. One hears and reads different opinions concerning bodkins, but at least compositors know how to manipulate them, and complaints of injury to the type by the bodkin are rare. Our American friends, on the contrary, denounce the bodkin as a rule, in terms which would amount to its being a friend of the typefounder. Why should practical men advocate its extinction?

Good Work.—It is supposed that every printer who starts a printing-office does it with a view to pecuniary profit. With this purpose foremost all men differ in their modes of attaining it. Some build wisely and well, and endeavour to make themselves first and foremost in their profession. They count upon the fact that good work is appreciated everywhere, and by the exercise of skill and patience succeed in producing such work, thereby winning for themselves lasting reputation, which aids largely in bringing them new customers, as well as helping them to retain the old. Too many, however, are prone to think that, if a job is not exactly right, "it will do," because the customer may not know enough of printing to be a competent judge of the merits of the work. This is a wrong principle. Whatever is worth doing at all is worth doing well, and in these days of sharp competition the well-doing will often prove an important advantage in the fierce struggle for supremacy. It is certain that slip-shod work will not pay for a great length of time, and that customers who find their work carelessly executed will in time turn to some one who will see that it is done properly.

The Origin of Italic.—The form of Roman now known as Italic was originally called Aldine. The first volume printed in this character had the capitals with their stems upright like those of the current round hand. These first editions were the works of Virgil, printed by Aldus Pius Manutius, in 1512, and it is known that this celebrated

printer made use of a manuscript text entirely copied by Francesco Petrarca. Thus, it is said, that Manutius desiring to pay public and reverent homage to the author of the Canzoni, appropriately wished a hanging character cut in imitation of his writing, entrusting the design and the cutting to a skilled artist, one Francesco da Bologna. But the fashion of these editions in cursive italic type lasted only a short time, having been imitated by foreign printers in a careless and illegible manner. The cursive character was at that time known both in Italy and outside of the country under the name of Aldine, but later the title of cursive was given to it from the writing of the Roman Chancellery, called *cursiveti seu cancellarii*; a title which in Italy has superseded every other.

Accented Letters may be easily and effectually made by the shoulder of the letter being cut off, say, one-sixth of an inch, and, in the case of a diaeresis accent, soldering on the top part of a colon with a small blowpipe; the letter afterwards being filed and dressed. Other peculiar and accented letters can be made equally well: a little thought and ingenuity will overcome many obstacles.

Original Design in Composition.—The young printer who desires to perfect himself in his chosen profession, should carefully study every new design he sees, and should note its attractive features or the points which give it a new and novel appearance; a pencil sketch of the design might also be made. Every printer with a love for his trade ought to be able to sketch sufficiently well to do this. He could then paste these copies and pencil sketches in a scrap book kept for that purpose. The studying and originating of new designs consumes more time than the employer can afford, and more than can be legitimately bestowed on the average work at the present state of close competition in the printing business; but a collection of designs kept in this manner will save the printer much time. By this means he is enabled to see at a glance some ribbon or panel design, or other ornamental device, which will suit his purpose for the work in hand, and can execute, by a combination, a piece of work the novelty and beauty

of which will be limited only by his ideas of harmony, skill in execution, and attention to detail. New ideas are not originated every day, and when one is seen it should be carefully preserved in the manner suggested. An unpretentious design, well executed, has more beauty in it, and is more pleasing to the eye, than a more elaborate and ornamental one when carelessly executed.

THE WATER JUG AND SPONGE.—One of the most disreputable combinations in a composing room is the water jug and its sponge. Generally it is a beer jug with its handle broken, or a beer can with the handle off, to hold the water, and for a sponge in hundreds of cases, a lump of paper. Such articles do not tend to raise the tone of the workmen, neither do they show the manager in a very good light, as he is responsible for every detail. A man to rule compositors must have the eye of a hawk, and an almost despotic will, otherwise he will find himself simply the manager by name. Compositors are extremely shrewd, and, if an advantage can be taken, such as coming in late, leaving cases on frames, cutting leads and brass at will, etc., they are sure to do so, and the only one to blame is he who lets them perpetuate an error.

HELPFUL HINTS.—The path of the printer is beset with difficulties and perplexities. Printing is essentially a business of detail, and in any one of these details a problem is likely to present itself or an accident is likely to occur. An intelligent recognition of these facts, and constant watchfulness, are necessary to one who is to be master of the trade. Type, leads, and rules are treacherous particles, always liable to get out of place, and reluctant to return to their proper position unless forced to do so. Therefore, the thorough printer must be patient, and the process of learning the trade will either teach him the lesson of patience or make him nervous and fretful at his labours. More time is wasted through lost motion, in the printing trade, than through slow action. The latter is not necessarily a fault, provided the actions proceed intelligently. The "hustler" is not the most profitable workman, nor does he accomplish more than the plodder. Thoroughness should be the prime

requisite in all that is done. It is not uncommon to see a printer sweating and fuming over a forme he is trying to lock up, when a few moments' careful examination would reveal the weak place in it, and the remedy would be apparent. Perhaps the whole difficulty was caused by two leads passing each other, or possibly a "soft" column, or even a wrong fount quad, which could not be discovered by the proof-reader.

A Useful Tip.—All compositors appreciate the difficulty of cutting a strip of card the exact length of a measure, and the annoying result of getting it too long or too short. This trouble can be overcome by cutting the card a little short, and then cutting it in two in the centre diagonally. The card will then come out true at each end, will bear on the type at all points, and if it swells will spread inwards.

Title-Pages.—A writer contrasts the title-pages of to-day with those of the past, to the decided disadvantage of the former. There can be no doubt that there was much more character and individuality in the old than there is in the new. The disposition of the type was less conventional; and the illustrative borders and the like had a picturesqueness of which the glory is now altogether gone. Title-pages certainly used to have a quaintness, and usually a special appropriateness, to which they can now lay no claim. They had a meaning of some sort; they were the elaborate portals through which the reader passed to the books themselves, foreshadowing in some respects the matter which there awaited him. The modern title-page is a very much simpler affair, and, for that reason alone, may commend itself to the majority. It is at least clearly set forth and readily mastered—save, perhaps, in a few exceptional instances, which do not count. *Simplex munditiis* might be the well-deserved motto of the average title-page as we now see it. Nor, for the greater number of volumes, would one particularly care to welcome any more elaborate treatment. In the old times books were few and precious; they were valuable, and were valued. Nowadays only a minority are *éditions de luxe*. Most are produced less for beauty and permanence than for utility and the moment.

On such it would be waste of money and care to bestow title-pages other than the plainest and the neatest. Books are now multitudinous, and we are a business people. What, therefore, is of the first importance is that the title-page of a volume shall contain little print, and be easily conned. A plea may be put in, on behalf of the bibliophile, in favour of the invariable presence on the title-page of the date of publication, for, without that, a book is like a child without a record of its birth or baptism.

Displaying of Titles.—Aim at simplicity, whether a crowded or open title-page. Do not use fancy types, and rarely a black letter. If the work is in modern or old-style type, use the same kind of face, and do not mix the two styles. Good round letters are preferable to any condensed fount, and if red lines are used in the title, it is best to balance the colour by having, say, a red line at top and one at bottom. In large pages, a line in the middle might also be introduced.

Numerals on Title-Pages.—Some of these Roman numerals used in old titles and colophons are difficult to decipher, and the following will help the reader:

Roman.	Arabic.	Roman.	Arabic.
C	100	MM	2,000
CC	200	MMM	3,000
CCC	300	MMMM	4,000
CCCC	400	IƆƆ *or* $\overline{V}$	5,000
IƆ *or* D	500	CCIƆƆ *or* $\overline{X}$	10,000
DC	600	IƆƆƆ *or* $\overline{L}$	50,000
DCC	700	CCCIƆƆƆ *or* $\overline{C}$	100,000
DCCC	800	IƆƆƆƆ *or* $\overline{D}$	500,000
DCCCC *or* CM	900	CCCCIƆƆƆƆ *or* $\overline{M}$	1,000,000
M *or* CIƆ	1,000		

If the lesser number be placed before the greater, the lesser is to be deducted from the greater; thus IV signifies one less than five, *i.e.*, four; IX, nine; XC, ninety. If the lesser number be placed after the greater, the lesser is to be added to the greater; thus VI signifies one more than five, *i.e.*, six; XI, eleven; CX, one hundred and ten. A

horizontal stroke over a numeral denotes a thousand; thus $\overline{V}$ signifies five thousand; $\overline{L}$, fifty thousand: $\overline{M}$, a thousand times a thousand, or a million. IↃ or D signifies five hundred, the half of CIↃ. M or CIↃ, a thousand, from *mille*. The latter figures joined at the top ↀ, formed the ancient M.

The Use of the Long ſ.—The old-fashioned and long ſ should only be used as an initial or medial to any word, and not as a final. The ligature letters containing the long ſ should also be adopted when they fall together, as the serif of the ſ would not allow the following ascending letter to close up to it without breaking off, as these letters will show: ſt, ſh, ſb, ſk. Double ſſ and ſſi are also cast in one piece, but in no instance must a long ſ actually finish a word; the letter attached to it, when a ligature, of course may do so.

Ingenious Printing Device.—An invention of a printers' engineer accomplishes, it is said, a decided reduction in the cost of such printing surfaces as types and blocks, enabling them to be produced in a much shorter time than is at present practicable. A layer of composition of glue and glycerine or treacle, such as that used in the manufacture of printers' rollers, composes the printing surface, being mounted upon paper or straw board, then upon a wood or metal base, type high; a rotary cutter is then used to cut out the required letters or design from the composition, the surrounding material being stripped off. The design may be in intaglio, or relief, as desired.

The Preservation of Page-Cords.—These may be rendered very durable by putting for an hour in a solution of lime, drying, and subsequent immersion in tannin. After being taken out and once more dried, they are saturated with oil.

Zinc Rules.—Zinc will not stand atmospheric influences—the face will oxidize, and crumble away in time. The mixture of zinc, also, either with stereo plates or types, is a fatal error.

Rough Proofs.—It has been said, Never show a rough proof to a foolish client. It would be better to say, Never show a rough proof to *any* client. Printers lose far more than they have any idea by showing rough proofs. To begin with, the client is disgusted, and first impressions are everything. It is no use saying, "This is only a rough proof," because for any meaning it conveys one may as well say, "Abracadabra folderiddlelol." A client has been known to take a rough proof and show it round amongst his friends as a specimen of so-and-so's printing. There are successful printers who at an early stage of their career grasped the force of what is here advanced. From the first they got out their proofs in a workmanlike manner on good paper, and great has been their reward.

Origin of Roman Type.—This character with lower-case, modelled after the cursive writing of the twelfth century, was first reduced to symmetry and used as a body type for bookwork in 1471, by Nicolas Jenson, a famous printer of Venice.

Large and Small Paper Editions.—A publisher has a very expensive book to produce containing finely engraved cuts on almost every page, and he wishes to have a large and also a small paper edition, but bases his hopes of profit on the sale of the large, which is to be published by subscription. A small paper edition, limited in number, is required only for enhancing the value of the large. Given the case as stated, is it possible to produce a large and small paper edition without reimposing and thereby entailing additional expense? It would seem impossible to produce both a large and a small paper edition from the same pages of type without altering the furniture and making-ready again, although by saving the "make-ready" sheets and cutting them up to fit the altered formes, the expense of making-ready a second time could be very materially reduced. But the expedient may be adopted of imposing the work with extra wide margins at fore-edge and foot, which, as our readers are aware, makes a very effective looking page. Supposing 750 large and 100 small paper copies be required, 850 large would be worked. In the

extra 100 copies the margins would be reduced, the back being left intact. The value of the paper wasted in trimming is hardly worth considering. This, however, would be rather too expensive a plan if the numbers of large and small editions were reversed.

PROPER NAMES.—As an interesting and valuable comparison of the number of capital letters required for an average collection of proper names, the following table has been published of names in the "New York City Directory," containing 313,992 names beginning with each letter of the alphabet: *A*, 7,643; *B*, 29,721; *C*, 21,808; *D*, 16,016; *E*, 5,971; *F*, 14,408; *G*, 15,560; *H*, 24,842; *I*, 1,106; *J*, 5,429; *K*, 15,798; *L*, 15,097; *M*, 34,048; *N*, 5,604; *O*, 5,924; *P*, 10,540; *Q*, 919; *R*, 15,927; *S*, 33,652; *T*, 8,098; *U*, 1,114; *V*, 3,728; *W*, 18,663; *X*, 10; *Y*, 913; *Z*, 1,453.

A PLACE FOR CUTS.—The too common practice in printing offices of dropping cuts and stereos of all kinds "wherever it comes handy,"—on top of racks, in sort cases, or under the stone—is not only slovenly, but it is inconvenient and wasteful. The time lost in hunting them up under such circumstances, in a moderately busy office, would soon pay for a cabinet for their reception. In every well-regulated printing office there should be a suitable receptacle for these blocks, properly labelled, and if catalogued and indexed, so much the better. If the cuts aggregate a large number, a cabinet, specially made if necessary, should be provided, where every one should have its appropriate place, to be kept there when not in use.

A SUGGESTION FOR POSTERS.—It is a good plan to keep a complete set of sizes of posters, say from foolscap to quad-crown or larger, hung in a convenient place for customers to select for themselves the one most suitable for their requirements. They may be each mounted at the head on a strip of cloth about an inch in width, so as to be all the more serviceable, and might overlap each other according to size. A customer much prefers to select for himself rather than have any particular size forced upon him as it were.

TABLE OF SIGNATURES AND FOLIOS.

No.	Sigs.	Fol.	4to	8vo	½ Sh. 8vo	12mo	½ Sh. 12mo	16mo	18mo	
1	B	1	1	1	1	1	1	1	B	1
2	C	5	9	17	9	25	13	33	C	37
3	D	9	17	33	17	49	25	65	D	73
4	E	13	25	49	25	73	37	97	E	109
5	F	17	33	65	33	97	49	129	F	145
6	G	21	41	81	41	121	61	161	G	181
7	H	25	49	97	49	145	73	193	H	217
8	I	29	57	113	57	169	85	225	I	253
9	K	33	65	129	65	193	97	257	K	289
10	L	37	73	145	73	217	109	289	L	325
11	M	41	81	161	81	241	121	321	M	361
12	N	45	89	177	89	265	133	353	N	397
13	O	49	97	193	97	289	145	385	O	433
14	P	53	105	209	105	313	157	417	P	469
15	Q	57	113	225	113	337	169	449	Q	505
16	R	61	121	241	121	361	181	481	R	541
17	S	65	129	257	129	385	193	513	S	577
18	T	69	137	273	137	409	205	545	T	613
19	U	73	145	289	145	433	217	577	U	649
20	X	77	153	305	153	457	229	609	X	685
21	Y	81	161	321	161	481	241	641	Y	721
22	Z	85	169	337	169	505	253	673	Z	757
23	2 A	89	177	353	177	529	265	705	24mo	
24	B	93	185	369	185	553	277	737	B	1
25	C	97	193	385	193	577	289	769	C	49
26	D	101	201	401	201	601	301	801	D	97
27	E	105	209	417	209	625	313	833	E	145
28	F	109	217	433	217	649	325	865	F	193
29	G	113	225	449	225	673	337	897	G	241
30	H	117	233	465	233	697	349	929	H	289
31	I	121	241	481	241	721	361	961	I	337
32	K	125	249	497	249	745	373	993	K	385
33	L	129	257	513	257	769	385	1025	L	433
34	M	133	265	529	265	793	397	1057	M	481
35	N	137	273	545	273	817	409	1089	N	529
36	O	141	281	561	281	841	421	1121	O	577

Some Hints on Spelling.—Mr. F. Howard Collins, in his "Author and Printer" just issued, includes a useful collection of words of the troublesome "ei" variety. The list is as follows: *Words spelt with ei.*—Being, ceiling, conceit, conceive, counterfeit, cuneiform, deceit, deceive, deign, deist, deity, eider, eidograph, eight, eighth, etc., either, feign, feint, foreign, forfeit, freight, gaseity, heifer, heigh-ho, height, heinous, heir, -ess, heterogeneity, homogeneity, inveigh, inveigle, leisure, neigh, -bour, -bourhood, neither, nonpareil, obeisance, perceive, plebeian, receipt, receive, reign, reindeer, reins, seidlitz, seignor, seize, skein, sleight, sovereign, spontaneity, surfeit, their, theism, veil, vein, weigh, -t, weir.

Capitals I and J.—Regarding the confusion by printers of the capitals I and J in Old English and other text-letters, an authority on the subject writes: The capital J belongs to the Roman alphabet, and it is a variant of the capital I, found in the old Italian alphabet, which formerly classed both letters the same and represented their sounds interchangeably with capital I only. The capital J has no place in old gothic or black-letters, and it is only since these old blacks came into more modern usage that a capital J was designed or invented. Many of the old founts, more or less in use to-day, have only the capital I. The capital U is another character evolved by needs, it originally being represented by V in both sounds of vowel and consonant, the U as now made being the cursive form of the parent letter V. There are several of these antique characters misused by printers. Letters should stand for what they are, and the typefounder should furnish legible characters of positive meaning.

Punched Music on Pewter Plates.—The lines are drawn, after which the notes are driven in by a punch. When the plate is complete the hollows are filled with wax. The roller is passed over the plate with printing-ink, and then the whole is wiped clean. Part, however, adheres to the wax. The sheet is laid on and an impression is taken, resulting in the printed page. The text is executed by letters stamped into the plate, one at a time. They are consequently very uneven.

A Register for Standing Formes.—Much time may be wasted in every office unless standing formes are properly arranged for easy reference. Some method of listing the standing matter should be adopted, or valuable time will be spent in looking up supposed standing formes only to find that they have been distributed. A system which enables the foreman to tell in a minute whether or not matter is kept standing is worth mention. A card system is suggested as being easily and profitably adapted to any printing office. Although perhaps not actually necessary, it is well to number the various formes, as it will prevent errors when formes are similar. This number should be printed on each forme, though it can be set in type so small as to be unobtrusive. The top line on the card can be left blank, so that the customer's name may be filled in, instead of the department. This system will prove a great time-saver where a large number of formes are kept standing.

Old Contractions or Record Sorts.—In order to assist any one in reading the old texts, the following key to the most usual abbreviations of monkish Latin will be found useful:

1. A right line, thus (¯), and a curve, thus (˜), placed horizontally over a letter, denote: (¯) 1st, over a vowel in the middle or end of a word, that *one letter* is wanting, *e.g.*, vēdāt = *vendant*, bonū = *bonum*, terrā = *terram*. (˜) 2nd, above or through a letter = the omission of *more than one letter*, *e.g.*, aĩa = *anima*, al̃r = *aliter*, al̃ia = *animalia*, ablac̃o = *ablatio*, Wintoñ = Wintonia, nob̃ = *nobis*, etc. A straight line through a consonant also denotes the omission of one or more letters, *e.g.*, vob̃ = *vobis*, qđ = *quod*, etc.

2. ꝰ = *er*, or *re*, as the sense requires, *e.g.*, ꝰra = *terra*, ꝑdictus = predictus, *i.e.*, *prædictus*.

3. The diphthong is sometimes represented thus, terrȩ or terrȩ = *terræ*.

4. A straight or curved line through the letter p, thus, ꝑ ꝑ = *per*, *por*, and *par*. A curved line, thus, ꝓ = *pro*.

5. The character 3 at the end of a word = *us*, omnib3 = *omnibus*, also *et*, deb3 = *debet*.

6. The figure ꝫ at the end of a word = rum, ras, res, ris,

and ram; eoȝ = *eorum*, libȝ = *libras* or *libris*, Windesoȝ = *Windesores*, Alienoȝ = *alienorum*, etc.

7. &̄ = *etiam*, q̨ = *que*, *quia*, and *quod*; ꝯ at commencement of a word = *com* or *con*; ꝯmitto = *committo*, ꝯvicto = *convicto*. This contraction is also printed thus, ꝯ. ꝯc̃ = *concordia* or *concessio*. In the middle or end of a word ꝰ = *us*, Deꝰ = *Deus*, rebꝰ = *rebus*, Augꝰti = *Augusti*; also for *os*, pꝰ = *post*, pꝰt = *post*.

8. In Domesday Book ⁊ = *et*, ē = *est*, s̃t = *sunt*, M̄ = *manerium*, m° = *modo*, dim̃ = *dimidius*, etc.

9. *Est* is sometimes written ÷ ÷.

10. Points or dots after letters often denote contractions, *e.g.*, di. et fi. = *dilectus et fidelis*, e. for *est*, plurib. = *pluribus*.

11. ꝛ = *et* in later times.

12. A small letter placed over a word denotes an omission—pⁱus = *prius*, tⁱ = *tibi*, q°s = *quos*, qⁱ = *qui*, etc.

13. Xp̃s, Xp̃c, Xp̃o, stand for Christus and its different cases. Mẽ = *Marie*.

These are the most common contractions, but many more might be given.

Margins for Books.—The tendency of the earlier part of last century, by which we were given liberal margins to books, now seems to be much altered, and the width of the pages has been materially diminished. It would seem that publishers are now anxious to get as much upon the leaf as possible, and every expedient is resorted to for that purpose. This is not only the case with publications like magazines, or with heavy volumes like cyclopaedias, but has become the rule with histories, biographies, and critical works. It deprives the binder of the paper necessary for him to use to make the appearance of the book symmetrical, and forces him to place the reading matter so near the back of the leaf that it is with difficulty the book can be opened wide enough to allow it to be read. This is not as it should be. No book should be imposed or worked without allowing sufficient space between the pages for all the exigences of the binder, and, except in very small or thin books, the half-inch or so which is allowed is insufficient. The calculation for space must be made when the plan is

first laid out, and no considerations of economy should be permitted to interfere with a liberal allowance. The proportion which good books ought to have was settled by the early French, Italian, and Dutch printers two centuries ago, and has since been always followed by those who know anything of their business. The top and inner margins are comparatively smaller than those at the outside and bottom of the page, which are very liberal. In this way the shears of the binder occasion no great destruction, and to this action of the celebrated typographers and binders of early days we owe the preservation of the works upon which they bestowed so much care, which by our modern careless usage would have tumbled into pieces of themselves in a few years.

New Margin Gauge.—A printer of Caen has invented a new gauge for margin-making, to be used by clickers and others entrusted with the making-up of formes of book-work. The "Margeometer," as it is called, is a sheet of stout paper on which is lithographed a large triangle. This triangle is divided by transverse lines ruled at equal distances, and these are crossed by other parallel lines, figures being inserted at the points of intersection to facilitate calculation. "To determine the furniture necessary for any forme, the printer folds a sheet of the paper to be used for the work according to the forme, and places it on the Margeometer, the back to the left hand and the head upwards. He now marks the place of the first line to the left which bears a number, and thus ascertains the width of the inner margin; then he marks on the right hand the third line bearing the same number which shows him the width of the outer margin." The inventor's own description of the mode of using the apparatus, appears to us not very lucid; but the Margeometer must be meritorious, as it has not only been praised by the French printers' papers, but has won for its inventor a silver medal.

Lead Poisoning amongst Printers.—Possibility of poisoning by lead is agitating some printers, as it is found that the fumes given off from the metal-pots used for type-setting machines are causing many to suffer from chronic

stomach troubles and other illnesses. These the doctor ascribes to the action of lead. But whoever heard of a plumber suffer from poisoning when melting his lead for soldering purposes? Painters, we know, are attacked by painters' colic, which is set up by using white lead paint and the odours which are given off therefrom; but, speaking from a chemical point of view, the poisoning referred to which doctors ascribe to lead, is not due to lead at all, but to antimony. For this reason: When lead is melted, any fumes given off are arrested by the air and combining with the oxygen in the air become converted into litharge, a monoxide of lead (*i.e.*, the yellow film or dross that forms on the metallic lead), consequently no lead fumes escape into the air at all. In making type-metal, or stereo-metal, lead is not alone used, but the metal is an alloy of lead, tin, and antimony; or lead and antimony alone. Now tin is not a volatile metal, but antimony is, that is, when heated to a certain temperature the molten metal becomes vaporized and disappears into the air, and thereby poisonous fumes are given off from the casting of such alloy. Antimony is a slow poison, much more deadly than lead, and if doctors were to treat the patient for antimony instead of lead poisoning they would be nearer the mark, and better able to effect a cure for the sufferer. The symptoms of poisoning by antimony are: Metallic taste, vomiting, choking sensation, pains in the stomach, purging, thirst, cramp, cold sweats, head congestion, faintness, pulse and breathing weak, and finally general collapse of the system. The immediate treatment for such poisoning is to swallow a draught of tannic or gallic acid, tea or coffee, and as stimulants in severe states of collapse, hypodermic injections or morphia.

Wrist Drop.—This is a disease from which compositors sometimes suffer, and is caused by the lead poison introduced into their thumb and fingers mostly by the use of new type, and is characterized by paralysis of the wrist. The remedy is solution of potassium, in which the hand should be steeped, so as to expel the lead.

THE LINOTYPE

CARE OF THE LINOTYPE MACHINE.—Cleanliness is the great point in the care of the linotype. The machine should be dusted all over every day, and thoroughly wiped at least twice a week. The machine should be covered up at night. The magazine when new should be brushed out occasionally, but after a few months it can go for weeks; although if it be in a dusty room, or the cover not kept on when not working, or should it become oily from any source, it must be cleaned. When new, if the matrices do not come down freely (because somewhat rough), put a little plumbago in the channel [illegible] the offending character, and the trouble will [illegible] fail to drop out of the magazine at times because they bind on the divisions of the front plate.

ADJUSTMENTS AND OILING.—There are sometimes trifling adjustments out of line on the hundredth. Every part of the machine fits perfectly, consequently there is no need to hammer or force the parts into their places. It will go where it is intended to go if started correctly. Therefore, be careful in the use of two things—a file and a hammer. A file is one of the best tools, but in the hands of a man who does not know what he wants to do, it is the most dangerous. What is filed off of any part of the machine can never be replaced. One of the most frequent blunders in the care of the machine is the tendency of operators to treat it just as they would handle machine tools and other heavy, but not automatic machines. It is to be understood that this being an automatic apparatus, and the working parts generally light, and therefore easily interfered with, the conditions in this case are widely different from those

existing in machine tools. Everything should be loose, except where attention is called to the contrary, and the oiling is to be done sparingly; no oil is to be used on the cams or gear wheels. The journals should have best oil at long intervals (say once a week), and then not more than the journals will actually consume. Oil running down does no good; it is picked up by the hands of the operator and carried to the matrices, making them gummy and interfering with their freedom of action. Machines should always present a neat and clean appearance, so that they can be handled without getting oily hands. The absence of oil is particularly important on those parts coming in contact with the matrices, viz., assembling star, line elevator, two regular elevators, and the distributor; also the passages through which the matrices travel on their journey through the machine. All these parts must be kept scrupulously clean and dry, but the most important of all are the channel plates in this respect.

Casting and Metal Pot.—Take out and clean plunger every day; if not done it may get fast with dirt and be difficult to remove. If bad lines are being cast—either on the face or hollow in the body—see that the plunger is quite free, also plunger lever when uncoupled from the plunger. If these are right, see to the height of the pot, as the screws in the pot feet for adjusting the height may have worked out. To try height, first clean with rag the face of pot mouthpiece, uncouple plunger from the lever and bring the pot by hand up to the mould, as when casting, then lower the vice and look through the mould. The holes in the mouthpiece should be in the centre of the slot in the mould; if this is not the case, regulate the height by the screws in the feet—one on each side. If the adjustments are all right, knock off the mouthpiece and see if there is any dirt or hard metal behind it. Hold a pan or shovel in front of pot channel, and work the plunger gently by hand so as to eject a quantity of metal through the channel. This will bring with it the dross which has accumulated in the channel, and which cannot pass through the mouthpiece. This mostly occurs through using dirty metal or the old slugs over and over again without re-

melting and cleaning before using in the machine. When knocking off the mouthpiece use care, so as not to burr or swell the mouthpiece at the end, and before replacing see that there is no burr on the inside where it fits to the pot; and after driving it on again see that there is no burr raised on the face, or this will cause splashing. Knock the mouthpiece off as little as possible; try everything else before resorting to this, as where good metal is used one rarely has to remove a mouthpiece.

Temperature of Standard Linotype Metal.—It is very important that the temperature of the metal in the pot should be kept within the proper limits. A very high temperature results in porous and spongy slugs, defective faces, and a weak surface which will allow the letters to sink in printing. On the other hand, a temperature which is too low and near the solidifying point of the metal causes the same to adhere to the mouthpiece of the machine, and prevents the proper delivery of metal to the casting mould. As the metal gets low, new ingots should be added gradually. Large quantities should never be put in at one time, as they will cool the molten metal to a temperature unsuitable for casting. About 550° F. is the best temperature.

Heat Regulator.—This most useful appliance for regulating the heat of the metal is often abused and rendered useless. Never wedge back the spring with the idea of getting more heat, as by so doing the governor is disabled, and the spring becomes bent and useless. The valve should be quite free; if it becomes tight, take the regulator off and clean all the parts well—it will repay for the trouble. When once the regulator is adjusted do not keep altering it when there is a stick in the mould, or a cold face, but look elsewhere for the cause.

Keep Metal Free from Foreign Substances.—No other metals, such as zinc, brass matrices, old stereotype metal, or small type, or electrotype plates, etc., should be added to the linotype metal. They are all of a different composition, and render it unfit for use. The pots of the machines should be cleaned occasionally, because the oxide

or dross which collects around the well after some time prevents the free flow of the metal. Dross or oxide will also form on the surface of the metal in the pot, being formed by prolonged contact of the molten metal with the air. This dross should be removed with an iron ladle when its quantity becomes sufficient. This dross may be added to the molten lines before they are cast into blocks, and reduced to metal with resin.

Restoring Quality of Metal.—It is recommended that every month the metal obtained from the slugs be mixed with regenerative metal, in the proportion of from 2·5 to 3 lb. to 100 lb. This alloy is added to replace those ingredients of linotype metal which, from repeated melting and manipulation, are lost by oxidation or volatilization. By following these instructions the linotype metal is also kept up to standard in quality, and no trouble of any kind should be experienced.

To Regulate the Pressure of Metal Pot.—This is done by the nut on the bolt between metal pot and spring. To put more pressure on, screw this nut towards the spring, and to put less, screw it towards the pot. The spring should only have about 3-16 compression. The nuts on the bolt on the outside of lever should be screwed up to lever when the pot is at rest and no compression on the spring. Screw the nut next to raise to lever, so that there is no end play in spring between lever and nut next to pot, then lock the outside nut on to it. To see what compression there is on the spring stop the machine when the pot is up and the plunger about to go down; then see how far the lever has come away from the outside nuts—whatever that is will be the compression of the spring. Do not have more pressure than necessary to make the joints, mouthpiece to mould, and mould to matrices; if there is too much compression on the spring, breaking the spring and making the machine harder to drive may be the result.

The Care of Linotype Metal.—It pays to buy the best metal for whatever purpose it is to be used. The best metal will contain only the purest ingredients; seventy-five

to eighty-five per cent. is used as a base, and tin and antimony make up the remainder. Tin is used to make the metal free-flowing, and antimony gives hardness. Stereotype metal contains more antimony than linotype metal; this is necessary because of the much larger cast made in stereotype work. Typefounders use a copper-mixed metal, but it is cast at a higher temperature than are linotype slugs. There are certain proportions in which alloys may be formed. The atoms of one metal seem capable of forming well defined combinations with the atoms of other metals. If one of these proportions is exceeded there will be some free metal mixed with the alloy, and the free metal will cause trouble by giving to the whole mixture its own individual property; as too much lead type will make linotype metal too soft; too much tin would give too great fluidity, and too much antimony would make it too hard. One of the most essential things to keep the metal good is a re-melting pot. In the metal pot of the machine more or less oxidation takes place—the tin and antimony oxidizing first. With a re-melting pot the dross can be reduced and the metal kept uniform. A re-melting pot keeps the melting pot on the machine cleaner, as the dirt from the sweepings around the machines seems to go to the recess behind the mouthpiece sooner than other places, and will soon clog up the mouthpiece. Oxidation is not the fault of the metal and cannot be avoided. Metal dealers are only too glad to buy back the dross at a mere fraction less than the cost of the original linotype metal. It contains oxides of tin and antimony, for which metal they pay more than they get for new linotype metal. With a re-melting pot this dross may be reduced and the metal kept at its original composition. Powdered resin, mixed with the dross, bulk for bulk, and heated slightly more than usual, throws down the clean metal, leaving nothing but the actual earthy dust mixed with resin on the surface. This may be skimmed off, and then the usual lot of "dead" metal thrown in to be re-melted.

Re-melting Slugs into Ingots.—If the slugs from each day's work are melted repeatedly the metal soon becomes brittle and unfit for use. It is recommended that

the slugs should be accumulated from week to week. Before the melted slugs can be cast into blocks the metal must be purified. This is done by immersing a piece of green wood about 4 inches in diameter, and 7 or 8 inches long in the molten metal, in a suitable melting-pot set over a furnace, with a hood or other means to carry away the smoke. The green wood is attached to an iron rod in any suitable way. The metal must first be thoroughly melted, but not overheated. The green wood is then plunged into the molten metal, the door of the hood closed as much as possible, and the green wood allowed to remain in the metal about twenty minutes, or until the boiling ceases. Green wood is used to purify the molten metal. Gas and vapour are evolved from the green wood, the metal boils up violently, and the oxides contained in the interior of the molten metal are effectually reduced. After this what remains of the green wood is removed, and the metal is then thoroughly stirred and skimmed with an iron ladle. It is recommended to add a few ounces of resin to the molten metal before boiling out with green wood. This brings the dross to the surface of the metal, and the addition of resin is necessary when the dross from the pots of the linotype machine has been added to the slugs to be melted.

Imperfect Casting of Slugs.—The trouble is sometimes wrongly attributed to the matrices. If the metal cannot freely enter the mould, it chills before it strikes the matrices and produces a rough face on the slug. Cold metal clogs the mouthpiece and causes this, or dirt or oxides will do the same thing. If holes in mouthpiece are not entirely exposed to the mould cell the metal cannot enter freely, and chills. This can be proved by examining the bottom of slug and noticing whether the holes show full and round on the slug. The pot can be raised or lowered to obtain this result by means of the screws in the pot legs. If a poor, cheap metal is used, it will clog the mouthpiece oftener than good metal would. The flame under the mouthpiece should be full and blue, and not of a yellow cast. In the old-style machines there was not sufficient flame under the mouthpiece with one tube burner,

and in the new machines this is improved by directing more heat to this point.

HIGH LINES.—Bars should be ·918 in. to ·920 in. high. If there is more than one machine, keep all the same height. If a machine turns out high lines see if mould wheel is screwed tight, or if the centre screw in mould wheel spindle is loose. This screw ought to fit tightly on spindle, and, when adjusted, should not be disturbed. It should be set so that mould wheel turns freely, without end play; if the screw is too tight it will jam the spindle in the bearing. When mould wheel is off, the shoulder of spindle should be slightly prominent of the brass washer when spindle is pulled forward, and when pushed back it should go inside the washer. The washer is for taking the thrust when the mould wheel and metal pot advance; if the washer was off, the conical spindle would be jammed and the wheel would not turn. See that the mould wheel guide is screwed tight; this is to prevent the mould wheel from springing away when the mould is passing over the back knife. The support for the guide is to take the weight of mould slide and prevent jarring when back knife is cutting. The screw and pad in this should be set when the mould wheel is advanced on to the steady pins, and screwed up so that the pad can be turned by the fingers. After seeing that the mould wheel is right, see if the mould is coming up to the matrices when casting; if not, there will be a beard on each side of the slug. To try this, start machine as though about to cast a blank line, and stop machine when mould wheel has advanced its full extent, but before the first justification. The mould should be close to the vice jaw; but not so close as to stop the vice jaw from sliding freely, or it will prevent justifying. The mould should be close to the vice jaw without touching; after justification, the metal pot should give the final pressure to press face of mould against the matrices, so that after the line is cast the face of mould should be clear of metal on either side of line. If the mould is not coming up far enough and causing a splash on the face, the lines will be much too high. To set the throw of mould slide see the eccentric pin with lever attached. This pin is behind the column and passes through the lever and

link and into roller in cam wheel. To cause the mould wheel to advance closer, slack the cheese-head screw holding the pin, and pull the handle of pin towards the back of machine, and if the mould is too tight against the vice jaw push the handle of pin towards the front of machine. After setting correctly, secure the pin again with the screw. As this pin is difficult to get into the several parts through which it goes, do not take it out unless necessary. If the lines are still high the fault rests with the back knife. This requires careful setting. The mould projects slightly through the wheel, and the knife should be set to the mould, not to the wheel. To set back knife take off the mould wheel pinion so that the wheel can be turned by hand without turning the machine. Set the knife square across and close to mould, to present the cutting edge equal on each side of the mould, without putting much pressure on the mould. The knife should be clear of the wheel, but press slightly on the mould as it presents itself to the knife; do not jam a knife close up to the wheel, as it only takes the edge off the knife, and acts as a brake on the wheel.

Clean and Sharp Linotype Print.—Negligence is the cause of imperfect print from linotypes. If burrs, hair lines, or spots appear in the print, it is an indication of negligence or ignorance of the attendant. Burrs are due to four causes: (1) Failure to keep space bands clean; (2) Setting short lines; (3) Overheating the metal; (4) Failure to remove defective matrices promptly. With regard to the treatment of spaces, the automatic spaces or justifiers consist each of a long sliding wedge and a short wedge held fast in the matrix line. The hot type-metal, being cast repeatedly against the small wedges, has a tendency to adhere thereto and to accumulate on one side, forming a thin protuberance. If this accumulation remains on the space, it follows that when the space is introduced into another matrix line it will lie against the side wall of the letter in the adjacent matrix. When justification occurs, the projection bends or crushes in the wall, thus destroying the letter and forming in the outside of the matrix a depression into which the type-metal will flow.

The metal will flow into this cavity and produce on the slug raised burrs, which will receive ink and carry it to the paper and show between the letters. To prevent this burring every space band should have all the metal removed from the small wedge at least once each day. It cannot be wiped or rubbed off, but must be scaled or scraped off with a knife blade or similar instrument. The sides of the spaces must remain flat, and their corners square. Do not grind them, rub them on emery cloth, or file them. After removing all the metal, taking care not to roughen the surface of the space, rub the latter at the casting point with a slightly oiled rag, or a little hard soap and plumbago.

The Distributor.—The matrix pusher must work freely, and, when uncoupled from rod, should slide in and out without fouling. The spring cushion at end of pusher should be free, as this is intended to stop the rebound when a line of matrices is delivered to the lift. The lift plate must be set the right height and stroke by the screw. This screw must fit well so as not to work loose. Turn distributor by hand, and set lift low enough to get hold of the bottom of matrix. If set lower than is necessary, it will not lift high enough to clear the hooks, but will jam between the hooks and distributor screws. The lift should only raise one matrix at once, and the lift plate should be set to the thickness of the thinnest matrix in front of the two hooks. This is regulated by the bush between the two hooks; this bush, having a clearance hole for screw, can be moved a little either way. The blade at the end is to prevent two matrices being lifted at once; it should be long enough for only one matrix to pass, and if worn, it should be renewed. If the lift should stick and not lift a matrix, never force it, but push the matrix back, take it off, and examine it, as the notch may have a little metal in it. To take lift box off, withdraw the pusher, then turn handle to right, holding lift box in left hand; when the bolt is slack press the elevator and the lift box will slide down. In replacing, push it to the top towards the magazine, and lock up by turning handle to left. This is easy to do, but first try a matrix in and turn distributor by hand, for if the box is

not replaced in its proper position it will bend the matrices sent through it. Keep the guides straight and square, and the same distance apart, and see that the brass rod works freely, and that the end is set to release the automatic stop if any of the guides become bent.

To Change Moulds and Liners.—In changing moulds it is usual to have two in the mould wheel; for instance, say brevier and long primer fit the mould with liners from 14 to 24 ems. If both moulds are set to one measure, and it is only required to change the fount, simply turn the mould wheel half way round, and change the liners between the knives. First take out the cotter, holding the pinion in place, and draw the pinion to the front until it clears the pin which drives it—this will be about half the width of the teeth—then turn the pinion round until the mould wheel has turned half way, it will then be found that the pin will go in pinion again. Push it on and replace cotter. It is better to have a mark on tooth of wheel and pinion, so that if the pinion slips out of gear with the wheel, it can be readily replaced by aid of the marks. If this was put in gear a tooth wrong, the mould wheel would not go on the steady pins and might cause a breakage. To change knife liners, slack the two screws holding the knife-box on; take out the liners which are in, and replace with those required. Tighten the bolts gradually one after the other, or variation in the thickness of the lines may be caused. The brevier ejector will do for long primer if the same measure. If the measure is to be altered, take out the mould, remove the cap and the left-hand liner which slides on the fixed key in mould, and put in the one required. See that the bottom of slot in liner is right up to the key, and that end of liner is level with end of mould. Screw on cap again. This must be screwed up tight, or metal will get in between liner and mould and cause trouble.

To Change the Old Style Ejector.—To change ejector, put the point of hook into the hole in the ejector. This hole is bevelled on the inside and the point of hook is wedge-shape, so that by forcing the hook in the hole it presses the ejector to the right hand out of the part, and

at the same time pulls it forward through the mould. Put the one required through the mould and press into position; the countersunk side of the hole in the ejector must always be on the left, and the thickening piece at the end on the right. After changing mould, liner, and ejector, before starting the machine always try the ejector through by hand by backing the machine until the ejector lever can go forward to its full extent, then, by taking hold of the lever and passing ejector through mould once or twice, one can feel if there is an obstruction. It should be perfectly free; if not, the change has not been made correctly, and must be remedied before starting machine.

To Change the New Style Ejector.—A new style of ejector slide and blade is being put into use more simple and effective than the old one. The blade has three, four, or more holes, fitting in pins in the corresponding position of slide. There is a little lever on ejector slide: press this lever downwards, push the blade through mould as far as it will go, then bring the little lever upwards, the pins will then slide into the blade. Then try if everything is free, using the method described above.

To Change the Magazine.—To do this, insert the wire between the shoulders of escapement pawls and the bottom plate of magazine. Always put this in first, as its purpose is to prevent the pawls from going up when the rods are raised by the keyboard poker; if this poker was put in first the front row of matrices in magazine would be released. When inserting the poker leave the rollers running; if not, a key may accidentally be touched and not noticed; consequently the eccentric carriage would be down and the brass upright rod would be up, and if the poker was pushed in smartly it would probably bend them. Both pokers being in, unhook the brass hook and draw back the rods with the handle until the end of the hook is behind the projection on top casting of keyboard. Back the machine a little to allow the space band grabber to be moved out of the way of glass holder; slacken one screw in the glass holder frame, so that, the other screw being a fixture, the guides will come into the same position again when the screw

slackened is screwed up. Release the glass by taking off the catch and pull down the frame at the same angle as the steel plate under the guides. The bottom of this plate when pulled down is intended to go in between the top of guides and guide plate, which are bevelled to allow the top of frame to clear the magazine. When the frame is clear of magazine, let it rest against the bracket. Take off matrix tray at the back, and insert the strip of wood in mouth of magazine, and lock up the mouthpiece with the wing nut at the side. Raise the bottom of magazine and slide along the supporting bar. Do not lift the magazine off this bar, only high enough to clear the escapement springs. If lifted too high it will strike the lift box and damage it. The same applies when putting back magazine—that is, lift the escapement springs over the bar, then slide it along until the supporting screws are against the bar. See that these are close to the bar before lowering the bottom of magazine on to its supports. If the bottom is lowered before the top is right home it will damage the lift box. When in position, replace glass frame, hook on the rods, and draw out poker first, and then the magazine wire. If by mistake the poker and wire are taken out before hooking on the rods, it will have to be re-inserted; the one in the keyboard is an easy matter—put it in the same way as before. The one in the magazine is more difficult, and to get this in the escapement holders, the part on which the rods hook must be held down while the wire is pushed in. Raise the magazine up to do this by placing a piece of wood between the support and the magazine; it is best to take the magazine off again and lay it face down—it will then be seen what is required to get wire in again. Take care not to knock the brass bracket at side of magazine; this guides the rods and keeps them on the escapement hooks sideways, and if it gets knocked out of position the rods will slip off the side of the hooks. If this is the trouble, see if all the rods are in the centre of escapement hooks; if not, take off the bracket and slightly bend it the required way.

To Alter the Vice-Jaws and Assembler.—To alter these on the old-style machine cast a blank line, slack stop

screw on assembler bar, and place the line between assembler finger and star wheel; set the stop to this, and screw up again. This should be set so that the star wheel will turn when you have a line of matrices set which will just go into the vice-jaws, but so that even a hyphen will stop the star wheel, and when this is stopped the line of matrices will not enter into the vice-jaws. To set vice-jaws, take out cheese-head screw in the disk at the end of vice top left-hand side, place the blank line the size required between the jaws, and screw up the screw with square end until the stop block comes against the loose jaw, then replace the cheese-head screw. This may have to be altered when a line is cast with matrices; if the jaws are too wide the letters will overhang the slug, and if too narrow there will be an indent at the beginning of the line. The way to set vice-jaws of the new-style machine is as follows: The screw is fitted at the left-hand side with a wheel and handle to turn same. The disk, instead of having a series of holes drilled through it, has a series of notches on its outer edge; a little spring catch is screwed in to protrude over the notches of the disk. By depressing the little catch the wheel carrying the screw can be turned, thus bringing the nut either forward or backward. When screwing in the stop allow the jaw to close—that is, do not screw the stop tight up to the jaw, or the teeth will probably break or strip out of the rack pawl which keeps the jaws in position when open.

The Intermediate Clutch.—The intermediate clutch is for stopping the assembler star wheel when the line is accidentally overset and it is necessary to remove some of the matrices from the assembler. As the star wheel is driven by friction, this clutch should be thrown off whenever the line is overset, as the friction plate will wear out if the star wheel is held stationary while the belt is running. Some operators grasp the matrix belt and back up the star wheel without throwing off the clutch, thus wearing out the friction plate and stretching the matrix belt. This can be tightened by moving the upper pulley back after loosening the stud nut holding it, but this will seldom be necessary if the operator uses the intermediate clutch

throw-off. The shaft of this clutch will run dry if not watched, as the bearing is long and the oil cup distant. It can be removed by loosening the screw in the bevel gear and pushing the shaft to the front of the machine. After dressing with emery paper and washing carefully, drill a hole in the bearing midway of its length to make an additional oil hole before replacing the shaft. A pin through the knob works in a slot in the shaft to permit the knob to be pulled outward to stop the assembler belt, and a short spring offers friction to the movement of the knob so it will not slip out of engagement with the clutch pulley. A screw pin through the rim of the pulley runs in a groove in the shaft, which always turns, the pulley stopping when the knob is pulled outward and starting when the knob is pushed in, and the flanges on the knob engage the projections on the pulley.

Trouble with the Intermediate Clutch.—Sometimes just as the mould retracts, or on the ejection of slug, the knob works out and the matrix belt pulley stops. This difficulty may be put right by acting on the following directions. If the screw in the bevel gear is taken out, the shaft should come out without trouble, or it can be driven out from the back. There is nothing else holding it. If the spring in the clutch is weak, it would cause the clutch to slip out occasionally, and it should be taken apart and examined. If it still does not hold, slightly bevel the opposing faces of the clutch, but do not make the bevel too heavy, as there would be difficulty in throwing it out by hand. When corrugated rubber rollers are used, the trouble with them is that the corrugations wear off and thus decrease the diameter of the roller.

Main Driving Pulleys.—Pulleys must be oiled through the lubricator, and care must be taken that no oil gets inside the rim of the pulley where the friction clutches work; keep this part free from grit or dirt, and on no account put resin in. Should the leathers become greasy, take off the entire clutch and scrape the leathers so as to have a dry, clean face. The clutch is easily removed by taking off the outside nut and taking out screw which passes through the

centre of clutch frame and key into the driving shaft. The clutch is adjusted so as to just drive the machine, and to slip if any unusual obstruction should occur. This is to prevent breakages. If it should fail to drive the machine, find out where the obstruction is, and do not put on more tension or the machine will over-run. The friction is adjusted by two nuts, one on each side of the two levers. When more power is required, screw the nuts on; when less, screw them off. The nuts should be locked tight on both sides of the levers. Before locking these nuts up, and while the belt is off, pull out the handle, and knock out the stopping pawl. This is to allow the clutch to find its own centre before locking up the inside nut. If locked up with the clutch out of action, it may get slightly out of centre, and only one side of the clutch would be driving.

Keyboard.—Keep the keyboard clean at all times. Every day it should be brushed out between the keys, and no tobacco ash, snuff, or crumbs should be permitted about. Dirt will work into the horizontal key bar slots, and cause the bars to stick down, resulting in two or more letters being released at each touch of the key. The buttons can be cleaned with a rag and ammonia and water.

Tight Lines.—Never, under any circumstances, send a tight line to be cast. Forcing a tight line down into the vice jaws should not be permitted, as the result is always a longer line than the rest of the matter, and an irregular face on the slug, because the line cannot be properly justified against the edge of the mould groove. If a line is loose enough to permit of its being justified, one wedge space is sufficient; but if it is too tight when there is only one space band in a line, and sometimes when there are two, the space bands will most likely be broken. Care exercised in this manner will save the matrices and space bands.

Removing Defective Matrices.—Directly a matrix produces a hair line or develops any other defect, it should be removed. A proof from all the matrices should be taken at least once each week to develop any latent imperfections.

MATRICES.—To clean matrices, remove them from the machine, and wash in benzine, or rub the dirt from them occasionally, and brush out the channel plates.

MATRICES WEARING.—The usual cause of the left-hand ear being burred or worn is owing to the matrix carrier bar being worn in the slot, where it fits on the front guide, thus allowing the matrices to be knocked against the guide when the bar is lifting.

CLEANING MATRICES.—These do not require washing, but it is occasionally necessary to rub the dirt from the ears of matrices, either by rubbing them a few at a time on a board, or with a piece of felt slightly dampened with gasolene, but the dirt on the sides of the matrices should be allowed to remain, as it does not interfere with the sliding of the matrices in the magazine, and really assists in filling up depressions in the sides of the matrices and prevents metal entering between them while the cast is being made and showing as hair-lines in the print.

HIGH SLUGS.—What causes slugs to be higher on one end than on the other? These high slugs are ordinarily caused by accumulation of metal on back or face of mould. Metal will sometimes adhere to the right-hand locking-pin in vice, or on mould-disk bushings, and so prevent disk locking tightly against matrices and making slug just so much higher. One of the vice locks may be loose, and so allows vice to spring away from mould when disk comes forward. These locks have a collar threaded on their rear ends which can be tightened.

ERRORS IN LINOTYPE MATTER.—Proof-readers who have to revise linotype matter find that it is very apt to catch them napping, inasmuch as incorrect lines are left or the matter is transposed in such a way that it has to be re-written so that it may be reset. The transpositions are very troublesome, and the only safeguard consists in reading in the revise the lines where a correction has been made. Some of these transpositions are wonderfully made, and do credit to the operators' ingenuity in mixing things. A reviser has to be more alert than ever with machine-set

matter, and feels the truth of the time-worn appeal to editors to prepare their copy properly. So long as copy is badly prepared there will be extra work for the operator and the reader, provided that the employers require an immaculate production.

Casting Borders.—To allow of the casting of full lines of border matrices without spacebands, linotypes of the old pattern, in which the pump-stop was operated from the second justification lever, were equipped with a pin attached to a short chain hanging near the bottom of the first justification rod. A hole was bored through the lower part of this rod and the pin was slipped through the hole whenever such border lines were to be cast, this being necessary to prevent the levers rising and operating the pump-stop. With the new-style pump-stop, however, if the line of matrices is a full one, the cast will take place whether there are spacebands in the line or not, as the right-hand vice-jaw will be forced open when line enters jaws, and it will thus open the pump-stop. Another plan is to open the left-hand vice-jaw a couple of ems wider than the mould and use spacebands and quads at the beginning of the line, filling the true measures with border matrices. When the line is cast, only that portion of the matrices exposed to the mould-cell appears on the slug.

Linotype Borders.—Before setting a border with the least design in it, a diagram must be drawn. Obtain some cross-ruled paper—if possible about the same size as the type body it is intended to use. If this cannot be obtained draw the lines as well as possible. With the paper divided into little squares, it will not be difficult, by using some simple signs, such as dots, crosses, naughts, etc., to fill in a design. Upon reaching this point, decide which kind of border matrices the dots, crosses, etc., are to represent. Having done this, the design, or sufficient of it for working purposes, will be complete, and it only remains, if divisions have been used of a different size from the type body required, to calculate the number of matrices necessary to fill the space. Now is the time to approach the machine. But remember in nearly every design it will only be necessary to set one-half of it, for the other half can be obtained

by taking a second impression of each slug. Place the copy before you, and set line after line, using quads where required.

Low-pot Signal.—An attachment has been devised for the linotype which will notify the operator when the metal in the pot is low. This is accomplished by inserting a tube in the metal-pot and fastening it in such a way that a rod, which rises and falls in the tube with the height of the metal in the pot, is made to close an electrical circuit, which includes a lamp or other signal, when the pot comes forward. If the metal sinks below a certain level, the signal is given and the operator is notified that it is time to replenish the pot.

Short Lines.—The operator should take care to "set" his line as full as possible, introducing every word or syllable which will enter. Neglect in this regard produces widely-spaced and unsightly print, and also results in loose lines, allowing the molten metal to flow between the matrices. This injures the matrices, and produces burrs in the print.

Difference in Speed between German and American Operators.—A recent issue of the "Papier-Zeitung" seeks to account for the disparity in speed between the American and German linotype operators, and says in substance: "It is reported that the seven principal English dailies of Chicago employ machine operators, of whom five produce 7,300; twelve, 6,900; seven, 6,800; fourteen, 6,300; thirteen, 6,000; eighteen, 5,800; and twenty-eight, 5,300 ems on an average per hour. Operators in Germany do not average over half of this, for the following reasons: (1) In America the operator does nothing but finger the keyboard. To every four machines there is a machinist to keep them in order, while in Germany every operator is his own machinist. (2) The English language, owing to its shorter words, fewer capitals and uniformity of type, makes for greater speed. (3) Most important of all is the fact that the Americans have typewritten copy, while the Germans lose much time and torment themselves over all kinds of obscure manuscript."

Some Points for Operators.

Examine and clean the space-bands every morning before the machines are started. Moisten the thumb with a small drop of oil, and dip it into graphite and rub the spaces thoroughly at the casting point. Examine the spaces carefully and put aside all crooked or imperfect ones.

If letters are not coming right it may be found that the little trigger arrangement which trips after and stops the distributor trips too hard. This may be set to work very easily.

Look out for bent matrices. Straighten them at once. Hold each bunch to the light before running them in.

Look to dirty matrices. Take them out when giving trouble from this cause, and rub their ears with a cloth moistened with benzoline. Then rub their ears with a cloth dipped in graphite. Brush out magazine and clean escapement with a tooth-brush dipped in benzoline.

Measure height of slugs from each machine daily.

Put on a sharp knife directly the plate is found not trimming properly.

If the machine man complains that the slugs are forcing up the column rules, it will be because certain slugs have a taper upon them. Use a file. Set the permanent liner in to make the slug the proper length.

In setting type to print with linotype make the measure a paper thickness wider than the linotype measure; the type line will give with locking-up, the linotype will not.

When metal gathers on the back of the mould the knife is either dull or is improperly set.

To line up a leaky mouthpiece, turn the machine forward to the point just before the lever descends. Open vice, unlock mould slide, clean back of mould and coat with red lead mixed with oil. Force mould against mouthpiece. The red lead will show where the mould and mouthpiece come together. If the bearing is not even the entire length of mould, set pot by means of screws in pot legs until the red lead shows a perfect bearing the entire length of the mould.

Never file a mouthpiece. If it only bears at one end, move the screws in the pot legs. If the mouthpiece holes

are too near top of slug, the pot rests too high. If one changed the mould of a machine having such a fault to a mould for a very small type, one might get no slugs whatever.

The best vent is a straight groove between every other hole cut from top line of holes down. Never vent to top of mouthpiece.

To keep the eyes on the copy, instead of dodging from copy to keys is as important for the linotype operator as for the pianoforte player.

Do not forget that the rubber rollers may become hard as bone. Then the cams slip on them. Further, their hardness means a shrinkage in diameter.

In taking out a mouthpiece remember a few hard blows are better than many light ones. There is less liability to swell the mouthpiece.

Dross and dirt can soon be rasped out from a pot with a piece of steel $\frac{3}{16}$ by $\frac{3}{4}$ inch, with teeth filed on both edges and on one side.

Before putting in a mouthpiece after repair, spread a mixture of news ink and graphite on back of mouthpiece. Graphite will not corrode.

To repair the key-board, put in locking bars, remove magazines, take off all key-board rod springs and key-board rods, remove front key-board cam rack; take out lower key-board rod guide by removing the two $\frac{1}{4}$-inch round head screws which pass through the $\frac{5}{8}$ square steel. Some holes in the guide may be badly worn, requiring a new guide. Get one. Put bar back with $\frac{1}{4}$ by $\frac{3}{4}$ inch screws; put in key-board rod No. 1. It must rest in middle of first cam on rear rack, which is the lower case "e." Put on new upper rod guide.

Take out the cams from this rack and clean them. Wash them in benzoline. Lightly oil the cam shaft. Put aside any cams very loose on the shaft. See that key-board cam rod is perfectly straight and passes through the cam holes easily. Do the same with rear rack. Remove the $\frac{5}{8}$ inch square bar; get at and polish up key bars with emery cloth and oil. Always keep clean the key levers and face of key-board.

OPERATORS SHOULD NOT FORGET THAT—

The inside flange of clutch pulley must be kept clean.

If the machine slows up while casting or ejecting there may be oil on the inner surface of clutch pulley.

If the assembling mechanism slows up at the same time, the driving belt is slipping.

There should be $\frac{1}{32}$ inch space between the forked lever and the collar on the driving shaft when the clutch is in action.

This adjustment is made by the nuts on the end of the shaft on the old-style machines—by the screw between the vertical stop levers on the new-style.

When friction clutch leathers wear they must be renewed.

If machine stops with a jerk it is because pulleys are dry on the shaft or the clutch leathers or the surface they grip are sticky.

Grooves in first elevator jaws should be in line with grooves in line-delivery channel.

Adjustment is made by turning the barrel of connecting link at bottom of first elevator.

The flat spring must be lifted out of its seat before turning the barrel.

The first elevator descends of its own weight.

The elevator should descend low enough to allow lower ears of matrices to enter groove in mould freely.

Ears of matrices will be sheared if elevator does not descend far enough.

The elevator should rise slightly just before the slug is cast.

If elevator does not rise slightly the down stroke of elevator is not deep enough.

The down stroke of elevator is regulated by the screw in elevator head which strikes on vice cap.

The first elevator must rise high enough for guide blocks on transfer slide and elevator to match when transferring matrix line to second elevator.

This adjustment is made by the screw on bottom of first elevator on right-hand side.

The first elevator must slide freely in the gibs.

These gibs are slotted and can be moved to permit free action of the elevator and take up unnecessary play.

The knife-wiper is operated by descent of elevator.

If knife-wiper bar binds, it will prevent free descent of elevator.

On its up-stroke, the rod attached to first elevator lever should raise the knife-wiper bar high enough for the depression in the bar to catch on the spring pin in guide.

If latch rod on first elevator lever is bent it will prevent full up or down stroke of first elevator.

The brass wiper must be kept in place. Remove metal shavings from knives.

The wiper bar must be in its guide when closing vice.

The vice automatic must be set so that tight lines will stop the machine.

If automatic is not set properly lower ears of matrices will be damaged.

The adjustment is made by the screw in elevator head which strikes the rod projecting through the vice cap.

The adjustment must be made so close that if a hair space be placed on vice cap underneath the screw which regulates the down stroke, it will stop the machine.

Nothing must interfere with free descent of first elevator before changing vice automatic adjustment.

The elevator should be at its full down stroke when making this adjustment.

MACHINE AND PRESS WORK

THE FIRST-CLASS PRESSMAN.—What constitutes a first-class printer seems hard to determine when one considers the different kinds of press work done. One man may be very profitable on a low grade of work by reason of his economy of time and the amount of work he turns out, and as a success may rightfully claim for himself the above term. Another may be a good hand on a high grade of cut and book work where the eye of the artist is required, and where the slow process of making-ready is made up by the excellence of the work done and the high market price obtained for it when finished. Reverse their positions, however; let each man take the other's job, and it is probable they would both lose their jobs through incompetency in a short time, the one for not doing his work well enough, and the other for being too slow, while their employers would rate them as no good. Some few men are so gifted by nature that they can adapt themselves to all parts of the trade, but such men are rare and cannot be relied upon to do work as well as the specialist, and yet we may properly call them first-class.

THE INTRODUCTION OF HARD-PACKING.—Some forty odd years ago all work was done wet, with some exceptions. A customer who wanted billheads had to wait at least two days. The paper was carefully wetted down and allowed to remain till morning; then it was turned, to break the back of the sheets, and remained till towards evening, when the printing was executed. The sheets had then to be dried, which, as they were thick, required considerable time, and then were put into the standing-press.

After all this had been done, the job was ready for delivery, but although the indentation of the paper had been taken out by the standing-press, the gloss of the surface was lost. The moistening had effectually destroyed that. All other job work was done in the same way. When the cylinder or Napier press had been in use for a few years, it occurred to Mr. Oliver, of New York, that a smaller-sized press might be available for jobs, and if so the paper could be worked dry. This would make the paper appear much more showy, and would diminish, with a quick-drying ink, the time necessary for the execution of an ordinary order by two or three days. One printer before had essayed to use a small-sized press, but was not successful with it, probably owing to his using the same overlay system that he had found to be necessary in wet work. In Mr. Oliver's hands, however, it turned out well. The thick blankets were discarded, nothing being used except a few sheets of paper, or a thin overlay of rubber, and he speedily added other presses of the same kind. Most of the trade, however, while they acknowledged the seeming superiority of the new process, wagged their heads and declared that it could not last in the long run, as it was very hard on type.

Rapidity in Making-Ready.—Pressmen who have not become skilful at it wonder why others get their formes "up" quicker than they; and not having observant eyes or reflective minds, they jog along in their old ruts, while their fellows pass them in the race. There are three kinds of slow pressmen: (1) those born with thick wits, (2) those with lazy muscles, (3) those with active hands and brains, but who have had no chance to see how things are done by the rapid workers of the craft. The secret of success lies in the study of the chief inequalities of each forme, and in rectifying them by underlays before a moment's thought is given to the overlays or cut-outs on the tympan sheet. This is so simple that the inquiring reader may doubt it, but it is nevertheless true. How often has a pressman been seen fussing with an overlay—pasting here and cutting there, conscious that the foreman or employer was judging that he was consuming too much time. Had he first levelled up his forme from beneath, he would have been

surprised to find how little was left to be done on top. He would have discovered that he had brought up everything where it could be touched and thoroughly inked by the rollers. The neglect of this precaution is the cause of most of the trouble from stoppages for patch-work, in addition to the original waste of time from a false system of making-ready. The overlay is for finishing, precisely as the cut-out is. Both should be employed only for delicate differences of impression, never for serious ones.

Make-ready.—Effective make-ready is hindered if, after the first impression is pulled, there is a deep impression in the tympan. When this occurs, put on a new tympan, take out as many of the under sheets as are necessary to give a smooth, even impression on the tympan, then proceed with make-ready in the usual manner.

Save the Make-Ready.—How many pressmen are there who pause to consider that in numerous ways they can save trouble to themselves and time to their employers by a little system and forethought? The preserving of make-ready sheets of all jobs likely to be done again, whether in type or plate form, is one of these. It is a safe rule to keep the make-ready of every type job until the job has been distributed, and even then the pressman should carefully cut out and preserve the make-ready of all cuts or other difficult or tedious work which may be included in such job, before throwing away the rest. As to electro or stereo plate forms on fixed mounts, he should file them, for they are useful. Even should the margins be changed, he can easily cut the pages apart and adjust to the new margins by pasting the old make-ready over the pages in their position on the cylinder or platen.

Hints for Buyers of Machinery.—In buying a machine, see that, whether new or second-hand, it is strong and well made. Consider the standing of the maker, both as mechanician and machinist. A light-framed or shakily fitted machine will be dear at any price. Do not be deceived by beauty of paint or finish on exposed work, which adds nothing to the usefulness of the machine, and which may draw the eye from an examination of the working parts.

Uncover the boxes, and see whether the finish of shafts in their bearings is as smooth and true as the white and brass work of more exposed pieces. Take out screws and bolts here and there: see if the threads are deep, sharp, and well fitted. Look closely at the fitting of all toothed or pinion wheels; note whether they have been cast and filed to fit, or whether they have been accurately cut by automatic machinery, so that they will fit in any position. Slowly turn pinion wheels, and note whether there is any rattling or lost motion, or whether the teeth fit snugly, yet freely, so as to give even, steady motion. Closely examine all castings for pinholes or air-bubbles, which may be most easily detected in work which has been planed. See that the castings are heavy as well as solid. Look after oil holes and provisions for oiling. See that the castings are neatly fitted; that they do not show the marks of the hammer or file, which must be used to connect them if they have been forced or badly put together. Pay attention to the noise made by the machine when in motion: if fairly fitted, the noise will be uniform; if badly fitted, it will be variable or grating.

Keep Machinery Up-to-Date.—A printer when he buys a new press should endeavour to get all the latest improvements and attachments up-to-date. And he acts wisely in so doing; but how many employing printers fully realize the importance of keeping the machinery they have up-to-date by supplying new parts and improvements as they come upon the market? Do not buy an out-of-date press or other machine, unless compelled to do so owing to want of funds, or the machines will gradually deteriorate about twice as fast as they should, simply through want of thought. The average life of printing machinery is from ten to fifteen years, according to the class of work upon which it is used—and even after that it has a value for certain purposes for low-grade work—but in these days of rapid progress it will be practically out-of-date in five years, unless care is taken to keep it up to the measure of progress of its builders. It is not very costly to make a practice of adding new parts to a machine from time to time as they appear, and, whenever a repair is needed, to

supply a new piece for the old. It is not often that standard machines are radically changed throughout, and the money spent in small changes will come back when about to sell the machine and replace it by the latest. Keep machines up-to-date, and better service will be got from them and more money when it is decided to let them go. A press or other machine in good order will produce more and do it cheaper than an old one braced here and wedged there.

To Prepare an Overlay.—The best method of preparing a woodcut overlay is to take three careful proofs on a hard and smooth paper, moderately thin; then cut out slantingly all the light portions of proof No. 1, and set it aside to build upon; next cut out proof of No. 2 a great deal more, according to the character of light and shade and the judgement of the operator, and paste what remains with as little as will hold exactly in position over the first; then cut out such heavy portions of proof No. 3 as may appear judicious, and paste them also in exact position, and the "overlay" is almost completed, but may need a little dressing with a sharp eraser. By this simple process the pressman builds up a finished overlay which so operates on the impression of the engraving as to bring out the shades and manipulate the high-lights of the picture with all the artistic effects originally contemplated by the artist. He is also enabled to "cover" with the least possible amount of ink, which is a leading feature of artistic press work. But the young pressman must have experience in this particularly nice operation before he can expect to become proficient. The process is described above; but engravings vary so much in their general character that no definite system will apply universally. The student must possess a quick perception of what is demanded by each particular cut, and modify his judgement accordingly. An excellent plan is to keep before him the engraver's proof, and be guided by it as to the necessary amount of building up.

The Hand-press as Instructor for Inking.—It would be a good thing if every press-room learner of to-day could be given a few months' instruction in handling the roller.

One of the first lessons taught was how to "roll" so as to obtain an even colour over the whole forme, and the instruction was something like this: If an even colour is desired, one must keep an even pressure on the roller—not heavy on one end and light on the other. There are two or three facts regarding the inking of types or cuts with hand rollers, and they are as follows: Even rolling will give an even deposit of ink all over the forme. A heavy pressure will deposit more ink than a light one. A very light pressure will remove some of the ink already deposited unless the roller is greatly overloaded with ink. On solid blocks of large surface a slow and heavy rolling will give a more effective inking with the use of less ink than a more rapid rolling with lighter pressure. To ink a forme with the least amount of ink, carry less on the rollers and roll oftener with full pressure.

Some Hints on Press Work.—Do not try to correct the faults of hurried making-ready by a weak impression, and by carrying an excess of ink to hide the weakness. Excess of ink fouls the rollers, clogs the type, and makes the printed work smear or set-off. A good print cannot be had when the impression is so weak that the paper barely touches the ink on the types and is not pressed against them. There must be force enough to transfer the ink not only on to the paper, but *into* it. A firm impression should be had, even if the paper be indented. The amount of impression needed will largely depend on the making-ready. With careful making-ready, impression may be light; roughly and hurriedly done, it must be hard. Indentation is evidence of wear of type. The spring and resulting friction of an elastic impression surface is most felt where there is least resistance—at the upper and lower ends of lines of type, where they begin to round off. It follows that the saving of time which may be effected by hurried and rough making-ready must be set against increased wear of type. That impression is best for preventing wear of type which is confined to its surface and never overlaps its edges. But this perfect surface impression is possible only on a large forme with new type, sound, hard packing, and ample time for making-ready. If types are worn, the indentation

of the paper by impression cannot be entirely prevented. Good press work does not depend entirely upon the press or machine, neither on the workman, nor on the materials. Nor will superiority in any one point compensate for deficiency in another: new type will suffer from a poor roller, and careful making-ready is thrown away if poor ink be used. It is necessary that all the materials shall be good, that they should be adapted to each other and properly used. A good workman can do much with poor materials, but a neglect to comply with one condition often produces as bad a result as the neglect of all.

Printing from Woodcuts.—Fine illustrated work is sometimes printed from the woodblock instead of from an electro type. If the edition is small, all is well, but if it is a large number, so that the blocks remain all night on the machine, they frequently warp, and however beautiful the impression the evening before, it seems on the following morning as if the entire forme had slipped. The explanation is easy. A block consists almost always of several pieces of box-wood glued together. When the block is fixed in the forme and put on the machine, all goes well for a time. After everything has been made ready the printing can proceed, but imperceptibly the influence of the cold bed makes itself felt. The opening of doors, lifts, etc., produces cold or warm draughts, and the so-called "sweating" of the carriage. The moisture so produced is communicated to the block, which, especially if new, sucks it up, and so gradually dissolves the glue joints. The block works itself loose, and every time it passes under the cylinder it "lifts" and curls upwards. This, fortunately, only happens with large blocks, but it is difficult to find a remedy. Even if the block is brought straight again (which can be done by putting it into a cold stereotyping apparatus, covered merely with a blanket), the glue joints will still remain visible. To avoid this trouble and to print, after making ready, without the usual opening and warping of the wood, a simple, cheap, and excellent device may be employed. When made ready, lift the forme and lay under the forme a piece of thin gutta-percha of the thickness of paper. This substance is impervious to moisture,

and does not change with the temperature. The bottom of the forme always remains dry, and thus the cause of the warping is obviated.

THE PRINTING OF HALF-TONE BLOCKS.—The proper way to deal with half-tone blocks is to have a hard tympan, then pack the blocks at the back until they are perfectly level with the surrounding type. Care must be taken not to have too much underlay in the centre of the block, otherwise a rocking motion will be given to it. Should the blocks appear too low in the centre, it will be found effective to pull an impression on the third or fourth sheet below the usual make-ready sheet, and overlay the low places with two or three thicknesses of tissue paper, taking care that the pieces of tissue are varied in size so as to yield the greatest pressure in the centre. The hard outer edges of the impression may also be pared away on this sheet. There is no fixed rule governing the thickness of half-tone overlays; but in general cases three sheets of paper are used, although some employ three weights of paper, or, in other words, on three distinct thicknesses of paper, to secure their masterly and artistic results. On the other hand, some good printers use very little overlay, but give special care to the back of the blocks, and pack up until they are perfectly level with the type. Some printers apply an underlay between the bottom of the plate and the wooden mount; others have done this and found that the pressure when printing has crushed the underlay into the wood mount, and have, therefore, adopted a metal base with overlays only. In cutting the several overlays it is well to keep to the inside edges of the pieces used for that purpose, and if these pieces are cut out with a slanting edge, it will help to carry out the continuity of the tones. Finally, the best way to print half-tone blocks, after the overlay has been applied, is to use good ink, which must be black (if black is to be the colour), full-bodied, and short in tack. Set all the rollers as true as possible, and allow those covering the forme to roll it lightly. They must not dip below the forme, so as to strike it abruptly, but to roll gently over its surface. Carry as little ink as will yield full colour without filling up the medium tones

—that is, those covered by the second sheet of overlay—as these fill up first. A moderately heavy impression is necessary to bring up the tones; this, however, in a measure, depends on the kind of paper which is to be used for the job and the tympan on the cylinder. Should the blocks clog up with ink while printing, they should be brushed out with a pure bristle brush and turpentine or benzoline, and dried (gently dabbed, not rubbed) with a linen rag free from lint, finishing off by rubbing with the palm of the hand.

Printing on Rough-Surfaced Cover Papers.—This is a class of work which requires care. The best inks, whether white, black, or coloured, are finely ground and dense in body, with a minimum amount of varnish. Finely ground that they may not fill the forme and wipe on the edges of the same, and dense that they may not show the stock. A lead or zinc white is necessary in whites, and a red largely composed of vermilion. In printing nearly all of the lighter colours on dark cover paper, it is better to run colour forme first, or a forme matching all colours, in white or even twice in white. This same base is necessary in printing half-tones on dark covers. This work requires good rolling with abundant ink and roller pressure and best attainable distribution; a hard tympan—the hardest possible, and much care of the precautions for register. These porous papers absorb moisture readily, and unless note is taken of the influence of the atmosphere on paper, register will be bad. By reason of its weight this paper should not be piled high after printing, either with or without slip sheets, or else drying will be delayed and the sheets will stick together. It is better to have a number of trays and lay the work out in piles of from ten to twenty sheets according to the nature of the work. Where one colour overlays another, the first should be well dried before the second is printed, or slurring may result. In some offices this paper after first printing is hung up in small lifts over a hot air shaft to hasten drying, but this is bad policy, for what is gained in drying is more than offset by the difficulties of register occasioned. Considerable loss of time and material may often be saved if these

colour jobs are completely proved before running, and enough trial sheets run to verify register from time to time as the work proceeds.

Hard Packing and Fine Printing.—Book-printers gave up damp paper reluctantly. For the new method of printing dry compelled them to give up the woollen blanket which had been used between the paper and the pressing surface as the equalizer of impression ever since the invention of printing. That such an elastic medium was needed when types were old or of unequal height, or when the pressed and pressing surface of the press could not be kept in true parallel, needs no explanation; but the use of an elastic printing-surface was continued long after these faults had been corrected. The soft blanket, or the india-rubber cloth, often used in place of it, made an uncertain impression, which either thickened the fine lines of a cut, or made them ragged and spotty. It would have been useless to get smooth paper if the pressing-surface behind the paper could be made uneven. To get a pure impression it was necessary to resort not only to the engravers' method of proving on dry paper, but to his method of proving with a hard, inelastic pressing-surface. A substance was needed which could be pressed with great force, without making indentation, on the surface of the cut, and on the surface only. This substance was found in mill-glazed "pressboard," a thin, tough card, harder than wood, and smooth as glass, which enabled the pressman to produce prints with the pure, clean lines of the engraver's proof. Old-fashioned pressmen prophesied that the hard printing-surface would soon crush type and cuts; but experience has proved that, when skilfully done, this hard impression wears types and cuts less than the elastic blanket.

Underlaying Type Formes.—The mere overlaying of low type will not suffice to secure its face where the forme consists of new and old types mixed. The method is to underlay according to requirements all low letters or other characters found therein. The discrepancies in height can be discovered by taking a few impressions on several different thicknesses of paper which will be required in

making the underlay. After doing this, take one of the medium thick kind and use it to paste on the pieces of underlay to fit on the bottom of the low type. If this sheet shows too high in the forme, carefully cut the high part out of the sheet; then as carefully cut all low showing parts from the other thicknesses of sheets, and paste such parts on the sheet so reserved for the pasting on of the same. Cut the low parts a trifle smaller than the face of the type to which they correspond, so as to fit at the bottom more easily. When the underlay has been completed, accurately cut the registering marks on the underlay sheet, and fasten the sheet to the bottom corners of the type forme, using only sufficient paste to hold it on, because if any imperfection is overlooked or additional patching up required, the same can be attended to without much trouble, by simply detaching the underlay sheet and applying the additional make-ready. It is possible to bring up slight defects in low type by means of an overlay; but when the defect requires more than a thin piece of paper it will be best if an underlay is adopted.

The Creasing of Sheets on Cylinder Machines.—In dealing with the creasing of sheets on cylinder machines, it is necessary to ask a few questions, such as: What sort of paper is it? Is it worked dry or wet? Was it too wet? Is it worked with a blanket on the cylinder, or paper, or that oiled canvas, table-cover sort of material? If one has to work a similar sheet it is well to get the machine quite clean and sufficiently down on its bearings before beginning to make ready. Then put some sheets of paper on the cylinder, just enough to bring it at its printing surface to a level with the extra thickness of iron which is on the ends of the cylinders. Paste these sheets at both edges, and put them in their place damp. When they have dried they should be as smooth as glass and as tight as a drum. The forme should be laid on and put, if possible, into its place at once, for if there are several impressions of it the sheets get indented and spoiled. The impression should be very light to start with, and the job should be worked as light as possible. Very little patching should be done, and a sheet might be placed over all before starting, if by so

doing the pressure will not become too great. A glazed board from the warehouse might be put on the cylinder if necessary, so as to prevent the sheet puffing, or the canvas already referred to might be used instead of a blanket. If none of these things produces the sought-for result, a "bolster bearer"—that is, a rolled-up piece of paper—may be stuck on the cylinder below the margin of the page. If this fails no amount of description will be of help. Nothing short of positive assistance personally and practically rendered can be of the slightest use. It has been shown how not to get this crease, but no fixed rule exists, and such matters have to be met with care, and conquered with dodges, wrinkles, and the like, which can hardly be conveyed at the right moment by means of a printed discourse. As a proof that pressure is the principal cause of creasing, any one may try whether he can make a crease by adding more pressure, or by loosening the back edges of the cylinder sheets. He will get his crease immediately by so doing, and the inference is that by removing the cause the effect should also cease.

Cleanliness in the Press-Room.—A person writing on the subject of cleanliness, says, "Thinking the matter over I was planning how the press-room could be kept clean, and the thought came, how often when a person goes into a press-room he finds it dirty, everything every way, and, worst of all, the presses covered with oil, and under each one a veritable oil well. Then the pressman says that they have been very busy lately and have not had a minute to clean up. I venture to state that this pressman (and there are a good many such as he) will give a similar excuse if you drop in just after they have had a short run or dull time. Now, a plan I suggest is, each time a press is to be oiled up, take a piece of waste or woollen rag, and when the oil-hole is properly filled (bear in mind the hole was not made to hold a pint), wipe off what little runs on the outside, at the same time giving a quick rub to parts close by, then whatever has worked out during the previous run will be cleaned up and it will be found that very little has gone on to the floor, or, better still, have some zinc under each press. If this is done by the press-

man or feeder, every time he oils up, much of the dirt, saying nothing of the soiled jobs which are seen in many press-rooms, will be cleaned up and it can be done with hardly any loss of time, as some call it, but I think done with a saving of time."

Packing Rollers on a Machine.—On ungeared machines it is sometimes necessary to avoid the "wiping" of the roller on the extreme edges of the type, which causes an excess of ink on the part where the rollers pass over any opening between the pages of the forme. In order to get over this difficulty, thick card, or even pieces of leather, may be used as packing; the length should be a little more than the opening to which they are placed opposite. Let the extreme edges be bevelled off so that the rollers will run over without jumping. The exact height will be determined by experience, but generally a sixth or an eighth of an inch in thickness is sufficient.

Close Register on Deckle-edge Paper.—One of the problems which many printers encounter is how to print close register work on deckle-edge paper, especially when it is necessary to feed the ragged edge directly to the lay marks. The way in which work of this character may be printed with the most perfect register, even when outline type and illustrations in several colours are used, is as follows: Make the job ready in the usual way. Place the two bottom gauges in the same position as on an ordinary job, but do not put on any side guide, as is usual. Instead of usual cardboard "fenders" at the bottom, make the left-hand one of thin brass rule, about the regular size. The right-hand one may be of cardboard. Now take the paper in lifts, and place each pile under a weight of some sort. Then take a sharp knife and cut a slit about a quarter of an inch through the entire quantity, just where the brass "fender" will catch the slit when feeding. Remove the paper from under the weight, and take about fifty sheets and bend the right-hand side of the slit up slightly, so that it will catch the brass "fender" more easily. The brass "fender" takes the place of the side-gauge, and the slit in the paper giving a straight edge in

the feeding, the register is perfect. Of course the slit should remain bent open on each colour and forme until the job is completed, hence there are two straight edges to feed to through the entire operation in printing all the formes. If these directions are followed, there may be no hesitation about running the machine at full speed, and it will not be found difficult to feed after printing a few. The paper should be a trifle larger in size than the completed job, so that it can be trimmed down on the slit edge.

Useful Wrinkle for the Platen.—A printer complained that he could not make a colour job register on a Universal press. One or two questions elicited the information that the gripper movement had become so badly worn that the grippers "crawled" after striking the platen and threw the sheet out of register. Many printers have encountered the same difficulty, and will be interested to know what remedy was prescribed, which was simply this: Take two pieces of strong cardboard, each about two inches long, bend them near the centre, and with mucilage or paste secure each to the tympan sheet, so that the tongue, or the free end of the card, overhangs the sheet at a point beneath the gripper. These tongues, striking the sheet first, and being fixed to the tympan, will prevent any movement of the paper by the grippers, and ensure accurate register. This is a simple expedient, and costs nothing, but the knowledge may be useful some day.

Setting Gauges on a Platen.—Much time is often lost in guesswork. Ascertain the correct margin at the head of job, and mark the correct distance on the platen. Get a straight-edge, square it from some line in the forme to the margin mark, and draw a pencil line across platen sheet. Apply the gauges and it will be easy to get them straight first time.

A Platen Press Roller Adjuster.—There has been placed on the market a device for setting the rollers on job presses which seems to meet all requirements. It does away with the necessity of locking bearers in each forme, and can be adjusted to accommodate varying diameters of

rollers. Those using them say they would not be without them. This device is not a theoretical one, but is the practical invention of a practical man.

SLURRING ON PLATEN MACHINES.—The primary cause of slurring on these is a movement of the sheet in contact with the type, either at the time, or just before or after the moment of impression. If the tympan is absolutely taut, if the sheet to be printed lies perfectly flat upon it, and is held so during the impression, and the forme is impressed against it firmly without any spring in any portion of it, and without any side motion, and then leaves the sheet clean, there can be no slur possible. Slurring is always caused by a violation of some one of these ideal conditions. Technically speaking, it is practically never caused by the ink, but it is true that there are many papers very difficult to make lie absolutely flat on the tympan, and they will not show a slur when stiff ink is used, but will if the ink is very thin. It is, therefore, advisable to use inks that are fairly stiff on paper that does not lie flat. If the slur is made just before the point of impression, it is because the paper is curled and bulges against the type, and as the gradually increasing pressure forces it flat there is a slight motion of the sheet that makes the slur. Anything that will hold the sheet flat on the tympan will stop the slur. Extra gripping-fingers on the inner margins, strings across the grippers at the place where the bulge comes, if at the left end of the sheet a cardboard glued in the margin of the tympan and extending to the point where the slur shows, or a piece of press-board glued to the gripper-fingers, are all schemes used with more or less success according to circumstances. If the slur comes on the impression, it is either the result of an uneven setting of the impression screws, or a badly-worn machine. The former can readily be remedied. The latter can only be helped by the use of impression-bearers. A forme badly locked-up may bulge and cause a slur at each impression as it is forced back against the bed. If the slur is caused when the sheet leaves the type, it is probably because the grippers have not sufficient hold to pull the sheet away all at once, and it only half pulls or peels off with a dragging motion that brings the slur. Fine

sand-paper, glued sand-side up on the tympan under where the grippers touch the sheet, will increase their hold. Strings through the margins, and pieces of cardboard glued to the tympan and extending into open portions of printing are the most-used expedients. If the ink is very stiff, thinning it will make the paper leave the forme easier, and thereby tend to prevent the slur, but care must be taken not to get it too thin, especially if the paper is at all inclined to bulge.

Erecting the Columbian Hand Press.—Place the feet on the staple and raise it upon them; then place the bar-handle in, with the bolt belonging to it; put the principal lever into its place, and then the bolt which connects it to the staple; then the angular or crooked part, which has one square and three round holes, through it, into the mortise, which is in the projecting part of the long side of the staple, and place in the bolt which attaches it to the staple. In the extreme edges of the heads of the two before-mentioned bolts marks will be observed, and corresponding marks over the holes through which they pass; put the bolts in so that these marks meet together and correspond, and so on, until all the remaining parts are in their respective places. The four screws for the platen, which have heads on one side, are intended to attach the platen to the piston, which, being put into their proper places, are secured by the four small blocks of iron which accompany them. To increase the power, turn the nut in the rod so as to shorten it, and to decrease it, turn it the reverse way. By the nut on the iron screw, which connects the main and top counterpoise levers, the rise and fall of the platen may be regulated, so as to clear the head-bands of the tympans, which is done by screwing the iron nut up as far as is necessary. In adjusting the platen so as to approach the forme exactly parallel, it is necessary, after hanging on the platen and having a forme on the table, to square it to the tympans, then make a pull, and hold the bar-handle home until some one else screws the four platen bolts to an equal tightness. The small holes which communicate with the different bolts require a small quantity of machine oil occasionally. The impression may be increased

by putting thin pieces of tin or sheet iron, cut to the size of the plate of iron which lies between the platen and the piston, secured by the four screws on the top of the platen, and placing it under the piston; it can then be readily seen whether everything is in its proper place, by the perfect ease with which the bar-handle acts. As will be gathered, the impression is obtained by means of levers, somewhat on the plan of those used by Earl Stanhope in his press. The power is given by the heavy cross-beam at the head of the press, set in motion by pulling the bar-handle across, which acts on the horizontal rod attached, and also brings the elbow into play, great power being thus obtained. The top cross-rod, on which the eagle is placed, is the counter-weight, which falls back into its original position—having been raised in the act of impression—when the recoil of the bar-handle has taken place. These presses are made as large as double royal.

Erecting the Albion Hand Press.—Place the feet on the staple and raise it upon them; place the spring and box on the top of the staple, dropping in the long loop bolt, which is connected with it, into the long hole in the staple; then connect the piston by passing the round bolt through the hole in the staple, and fasten with pin and washer; put the bar-handle in its place with bolt, tightening it so as to allow the bar-handle to be free; then attach on, with the four screws, the slides or guide-pieces to piston; then put the chill into the piston, also the tumbler or wedge-shaped piece, taking care that the bright or numbered side is towards the bar-handle; then connect the chill with the bolt in the handle, screw up the nut or top of the spring-box sufficiently to draw back the bar, so as to keep all parts in their places. The wedge and brass guard in front of piston are intended to regulate the pressure. The other parts of this press may be fixed in the same manner as the Columbian. These presses are also made in very large sizes. The power is obtained by means of levers, which act on an inclined piece of steel called a chill; by pulling the bar-handle across, this chill is brought from the sloping into a vertical position at the precise moment of impression. On the bar-handle being allowed to go back to its original position, the chill resumes its former inclination, and the

platen is raised from the surface of the type by the recoil of a spring contained in the box at the head of the press; this then allows the forme to be run out, rolled, and run in again for successive impressions, the sheet as printed being first removed, and another laid on its place.

SIZES OF PLATENS OF HAND PRESSES.—Presses are made in various sizes, and classified, commencing with the smaller, as card, quarto, folio, and broadside, corresponding with the different sizes of paper used in printing. The size of platen determines the classification, and the same conditions apply to both kinds of presses mentioned. Card or quarto presses measure something less than the smallest dimensions now given.

Name of Press.	*Size of Platen.*
Foolscap folio	15 × 9$\frac{3}{4}$ inches.
Post ,, ...	16 × 11 ,,
Demy ,, ...	18 × 12 ,,
Foolscap broadside	19 × 14$\frac{1}{4}$,,
Crown ,, ...	21 × 16 ,,
Demy ,, ...	24 × 18 ,,
Royal ,, ...	26 × 20$\frac{1}{2}$,,
Super-royal ,, ...	29 × 21 ,,
Double crown,, ...	34 × 22$\frac{1}{2}$,,
Double demy ,, ...	36 × 23 ,,
Double royal ,, ...	40 × 25 ,,

CYLINDER AND PLATEN MACHINES.—The difficulty of keeping good register on the perfecting machines is sometimes caused by the platen machines being driven from the same shafting; the platens should be worked from a separate shaft if possible. Independent driving by electric motors is the ideal method.

FINDING THE PITCH ON A CYLINDER MACHINE.—One plan is to daub a little ink on one end of the cylinder opposite the grippers, and turn the coffin under till this mark is transferred to the impression bearer. A gauge should then be cut for future use, and the formes of works of varying margins may be adjusted to the exact position at once without fear of accident.

Slurring on Cylinders.—One of the difficulties a printer has to contend with is the habit some machines have of slurring. If the fault is his he can hope to avoid it next time, but if it is in the machine he cannot hope ever to master it properly without the aid of the maker. The engineer wants to know if the cylinder is on its side bearers, and if the paper is wrinkled, or buckled because of its edges being smaller than its centre. He will see if the machine is on a firm foundation, or on a springy floor; and also notice if the make-ready is too thick, and in consequence the cylinder is too big. If the slur on the machine is brought about by any of these causes the cure is not far off when the weak spot is discovered. If the slur is on the pitch it may be caused on perfecting "Bar" machines by the turning of the rack; or if on a perfecting gripper, when the thimble of the horizontal spindle is passing along the quadrant, and, if the forme is large, or in the case of a gripper machine of the "Frenchman" class, if the pitch falls a tooth too soon, and begins to print before the machine is steady, a slur cannot be prevented, even by packing the bearers with nailed-down pieces of leather. Machines usually print all sizes short of the largest size very well, but when a forme is very large a slur is often seen for the reason that printing commences too soon after the formes are started on their return trip, and while the moving parts are vibrating. When this is the case it is not easy for the printer or engineer to cure the slur, which might not happen if the cylinder was able to run about four inches on the side bearers before it began to print. Cog teeth are often the cause of slurs. Sometimes it will be noticed that a slur occurs in more than one place, and if the cylinder shaft brasses are all right this is mostly the fault of some teeth being larger or smaller than the rest, a frequent defect with cast teeth. When the printer locks the forme up too tight, and so lifts a corner of it off the coffin he will get a slur; if the tapes are not running well he will find the paper pucker, and a slur will result. If the make-ready is loose it will give a blurred impression.

Working Cardboard on Cylinder Machines.—In working cardboard on a small cylinder, a slur is sometimes

caused by the stiffness of the board, which prevents it from conforming readily to the curve of the cylinder, so that, as the impression ceases, the sheet flies out flat, making the job look dirty on the edge. This may be obviated by passing cords round the cylinder, fastening one end to the rod which holds the paper bands, the sheet moving under the cords while being printed. Another method is to take one or more pins, according to the size of the job, cut them off, so as to make them type high, or a fraction over; place them in the furniture so as to catch the end of the cardboard, and the slurring referred to will be prevented.

A Card Adjuster.—A simple device is manufactured by which the pressure of a rubber thimble against the end of the card or small sheet holds it firmly against the gauge-pin, thus ensuring perfect register in colour-work or embossing. It can be attached to the gripper and adjusted in a moment.

Cylinder Packing.—Never use rubber or other soft packing, except for old type. Hard packing for new type should be the rule, and do not pack deeper than will be level with the bearings of the cylinder. Use a couple of sheets of book paper for the outside.

Packing for Cylinder Press.—A medium thick manila paper makes a good tympan for the hard packing method of printing. The quality should be free from lumps and the grain run the long way of the sheet. It is possible to get the size required in rolls. Good book paper may also be used, and quite advantageously on much of the work, but for newspaper work a suggestion is muslin over a rubber blanket with a medium thick manila over that, oiled occasionally during the run of the edition.

The Management of Inks.—This seems little understood by many printers. Printing ink is substantially a paint triturated to extreme fineness. There are occasions, of course, when the least amount of colour which can thus be put on is sufficient, but it usually needs more, and especially for handbills and posters. The first requisite in this case is that they shall catch the eye quickly, which

cannot be done by hair-line faces or small quantities of ink. They should be charged with colour. Principal lines should have more impression than weaker ones; this is generally better accomplished by underlays than overlays, for not only is the impression stronger, but the line will thus take more ink. The more slowly the impression is made the blacker the line will appear, as the ink has then time to penetrate. It is well sometimes, when extra solidity of colour is required, to run a good piece of work through a second time. House-painters do not finish a house at once, but lay on one coat after another until the requisite intensity of colour is obtained. Especially should this precaution be followed for pale or weak colours, such as the various yellows. One great reason why this hue is hardly ever used by printers, except through bronzing, is that it always looks pale and ineffective on paper, and is lost in artificial light. The colour, in its various modifications with red and black, is very effective, as can be seen by looking at the leaves of trees in autumn, which are compounds of green, brown, red, and yellow, the first soon disappearing, and brown being the last to go.

Keep a Record of Inks for Estimating.—There is no reliable scale, theory, or work on this subject. It is simply a matter of careful observation and experience and a wise deduction from both. Observant colour printers have succeeded in getting pretty near the cost, by actual quantity used, of all inks entering into an estimate on a job, but they have acquired this by experience and by keeping records of the quantities used on general work. They also know that some grades of ink go farther in covering than others, and that the weight of almost the same colour often varies greatly. Not only do weights vary, but also the size of equal weights, such as one pound of rose lake and one pound of vermilion. Hence it is a matter which should be schemed out by a competent and observant practical man. That course will establish a record in a short time and eliminate most of the guessing.

How Much Ink?—Many estimates of the cost of books or jobs lead the employer into loss of the work or else loss

of profit when he gets the work, because of erroneous calculations of the amount of ink the work would consume. Few things in the business are more deceiving; even an ordinary book forme will seem like another one in general character, yet may be very different in its demand for ink. When we consider heavy formes with black letter, or heavy cuts, or solid tint blocks, the calculation grows a serious one. One forme of tints may use up four pounds of ink to every thousand impressions. An astounding quantity, some will say; but that is because they are not familiar with such work. In figuring quantities of paper or card, there is little difficulty, and little danger outside of a correct computation of how many can be got out of a sheet, save that of making an error in arithmetic as to cost. But the question of how much ink unusual formes will require is often a very serious one.

Hints on Using Inks.—All ink, when opened, should be lifted—especially in thick and drier inks—from the top, keeping the surface as smooth as possible, otherwise the side portions will "skin," and be apt to mix with the rest of the ink, spoiling the whole. All cans should be kept carefully covered to prevent "skinning," and all scrapings from table and boxes kept separate for poster or coarse work. If water gets mixed with ink, it will make it roll out badly and work specky. Any skin formed should always be carefully removed, to prevent its mixing with the undried ink.

Hint for printing Coloured Inks.—The freshness is taken out of bright coloured inks by their being distributed on the iron surface. Slate or marble is preferable.

How to work Copying Ink.—Some one complained that a new set of rollers sent him were no good because they would not print a job in copying ink. If he had known that copying ink can be successfully worked only with rollers too old and hard for anything else, he would not have spoiled his job and ruined his new rollers by trying to use them with such ink. New rollers never will work

copying ink, nor will any other new rollers which are good for anything. On a copying ink job put the oldest rollers in the office, after washing them clean and sponging off with water thoroughly, and the ink will work satisfactorily. In washing off copying ink use only water; benzine, turpentine, etc., will only set such ink and make it stick the tighter.

How to make White Ink print Clean.—In working with white cover-paper ink, it is advisable to carry as much colour as the face of the forme will permit and not fill up; but when running the printed sheets a *second time* (and this is essential to secure the best results), it is wise to run the colour a trifle scant on the work the first time through the press, and, after that has properly set, carry the last printing as full of ink as the matter will stand and not spoil the lettering. To be successful with the second printing, the greatest care is necessary in feeding in the sheets of stock in order that accurate register may be secured, otherwise the press work will be most disappointing in appearance.

Ink Difficulties in Cold Weather.—Employers would do well to inquire how the pressmen heat their slabs on a cold or damp morning. The common way is to roll a piece of paper—a clean sheet as a rule—light it, and then burn merrily under the slab. A more inflammable place than the press-room could hardly be imagined, for everything is of a combustible nature. It pays to have a few detachable gas tubes laid on, for it is nothing but gross carelessness to let such a practice continue.

Ink, Paper, and Tympan.—Too little attention is paid to this subject. A good job cannot be done with a common ink, nor *vice versa*. To obtain the proper grade of ink, multiply the cost of the paper by ten, remembering that for cuts or especially fine work the next higher grade must be used. The best way to settle the ink question in a country office is to have only three grades of it—good news ink, medium book, and a really fine job ink. The latter will do for the best paper, and for lower grades of paper can be reduced with a little ink reducer to the proper consistency

for each job as needed. Tympans also need to vary with the character of each job. The printer who tries to run a book forme on the same old rubber or felt blanket which prints the paper, need not be surprised at the lamentable failure. Take off the blanket, put in two or three thicknesses of best cardboard, and enough print paper to make the right thickness, then note the difference in results. On platens, tympans should vary with almost every job. Soft paper and large type require plenty of soft ink well pushed into the paper by a soft tympan; while hard, smooth paper requires just enough ink laid on the surface, with a snug flat impression.

Hints for Selecting Paper to Suit Ink.—Printing ink appears, when on white paper, blacker and colder than when on tinted paper; while on yellow or tinted paper it appears pale and without density. For taking printing ink perfectly, a paper should be chosen which is free from wood in its composition, and, at the same time, one which is not too strongly glazed. Wood paper is said to injure the ink owing to the nature of its composition. Its materials are very absorbent of light and air, and its ingredients are not satisfactory for colour. Pale glazed or enamelled paper, on the other hand, brings out colour brilliantly.

Use Good Ink for Cuts.—It does not pay to try to print cuts or fine letterpress on good paper with a poor quality ink. Use the thick-bodied, short ink for such work, especially on a platen press.

Black Ink on Coloured Paper.—When using black ink on a tinted ground, or on coloured paper, it is necessary to observe, that the black changes colour in many instances, or loses its intensity. Printed on a blue ground, its strength and power are lost; on red, it appears dark green; on orange, it takes a slightly blue hue; on yellow, it turns to violet; on violet, it has a green-yellow shade; and on green, it appears as a reddish gray. Printers should note these peculiarities of black, or they may find their work disappointing when done.

WHERE SHALL RED INK BE USED?—In ornate printing red is growing in favour, and the tendency is to work in heavy masses of it. A recent review of the use of red ink says that the mistake most frequently made is in introducing red inappropriately in masses where it is neither ornamental nor part of the general composition. To put it plainer, there is an increasing disposition on the part of printers to use great masses of red merely for the sake of obtaining a glaring effect. In the circular of a sale of paintings this tendency was strikingly shown. A pretty red initial would have set off every page handsomely, but to the one ornate crimson letter were added an ugly, red head- and tail-piece which, instead of rendering the red attractive, made it repulsive to the eye. No compositor of any taste would have overloaded a page with an ornamental initial and a head- and tail-piece, nor would the man who designed the circular in question have ventured upon such an overweighted design but for the sake of introducing plenty of red. A single line of red in a page of Gothic produces a highly attractive effect. One heavy letter or line of red in a page is pleasing to the eye; any further addition of red in mass may be a blemish.

FIRST PRINCIPLES IN COLOUR PRINTING.—Firstly, not so much colour; secondly, it is a good idea to observe nature a little; thirdly, a good rule is that strong contrasts harmonize. White on black in painting, black on white in printing, are the two greatest contrasts, the two extremes in colour, and the eye has become so accustomed to the combination that the picture becomes readily filled. And it may be said here, the best part of any job is the part that neither pressman nor compositor has anything to do with —the white. Judicious whitening in printing is what light and shade are in painting, one of the most essential features.

THE PERCEPTION OF COLOURS.—What is known as light is really a vibration of ethereal waves. There is no such thing as absolute colour. The variations which are called colours are differences in the number of vibrations by means of which light is transmitted through the retina of

the eye to the optic nerve and thence to the brain. Thus colour is determined by the number of undulations in the ethereal waves. The most rapid undulations produce the violet effect on the retina. These are calculated at 727 billions of vibrations per second; the lowest is vermilion, the rays of which impinge on the retina at the rate of about 450 billions of undulations per second. The perception of colours depends first on the rapidity of undulations of light waves, and, secondly, on the power of the retina to receive them. Colour blindness is a defect in the nerve network of the retina to recognize the minute differences between the infinitesimal variations of the ethereal light waves which reach the eye.

Method of Printing in Colours.—One method of colour-printing consists in taking any desired suitable pigments, preferably aniline, and dissolving them in a suitable solvent—such as water, alcohol, glycerine, oil, or any desirable mixture of either—and so prepared that the colours will not set too readily. Sheets or rolls of tissue-paper, silk, or other suitable fabric are then taken and saturated with the prepared pigment, different parts of any given sheet being saturated with different colours, and the pigment being applied in strips, spots, or according to the desired design. The paper will then usually need to be dried, or partially dried, to enable it to be handled and prevent smearing, and ensure a clean, sharp impression. The pigment may be applied by means of ordinary printing rollers, such as are used in calico-printing; or the paper may be impregnated by means of pens, pencils, or brushes, such as are used in preparing ruled paper; or, instead of a single sheet saturated with more than one colour, tissue-paper or fabric may be first impregnated with one colour, using it as a base, and then strips or designs of other paper or silk, each saturated with a different coloured pigment, may be laid over or secured to it, the whole being then dried as far as necessary, or the many-coloured sheets may be made of pieces connected at their edges, either before or after saturation with pigment, and then dried. One of the coloured sheets, prepared in either of the ways indicated and with any desired design, is placed in contact with the

paper to be printed and between the print-paper and the type, electrotype or woodcut, and the whole is then passed under the cylinder or platen of the press, as in ordinary printing, and the impression in two or more colours in any desired design is thus made without the use of the ordinary inking process; or the face of the type is first rolled with ink, so as to make a base colour; coloured strips are then laid over it, on the face of the type, and thus any number of colours may be printed at one impression.

Hints on Colour.—The following hints to letterpress colour printers will be found invaluable: Yellow and carmine or deep red produce scarlet or vermilion; carmine and blue produce deep lilac, violet, and purple; carmine, yellow, and black produce a rich brown; yellow and black, a bronze green; yellow, blue, and black, deep green; carmine and white, pink of any shade; ultramarine, white, and carmine, deep tones of lilac; violet and white, pale lilac or lavender; cobalt and white, lively pale blue; and Chinese blue, deep bronze blue, chrome, pale lemon, any tone of emerald green. Amber is made from pale yellow, chrome, and carmine. Red brown is made from burnt umber and scarlet lake. Light brown is made from burnt sienna shading with lake. Blue and black are made from deep blue or deep black. Salmon is made from burnt sienna and orange, shading with white.

Two Colours which harmonize well. Scarlet red and deep green. Light blue and deep red. Orange and violet. Yellow and blue. Black and light green. Dark and light blue. Carmine and emerald.

Three Colours. Red, yellow, blue. Orange, black, light blue. Light salmon, dark green, scarlet. Brown, light orange, purple. Dark brown, orange yellow, blue. Crimson lake, greenish yellow, black.

Four Colours. Black, green, dark red, sienna. Scarlet, dark green, lavender, black. Ultramarine or cobalt blue, vermilion, bronze green, lilac. Sienna, blue, red, black.

Colour Contrasts in Printing.—The essentials to strong contrast are a bright colour and a sombre one, so that one may be the foil to the other. Red and green are

the strongest of theoretical contrasts. They are complementary; pure red rays plus pure green rays reconstitute white light. But of all contrasts, red and green form the least effective in their purer forms. They are so nearly equal in intensity that the one is no real relief to the other. Red and blue make the best contrasts. The more brilliant and luminous the red, the deeper should be the blue. The velvety lustre of bronze blue enhances the gorgeous geranium shades of red; while ultramarine in its more violet tones presents a combination of depth and luminosity which contrasts effectively with ample white space and a single line of rose-madder or cherry red upon a poster. Many of the most exquisite of nature's contrasts, as seen on the petal of pansy or breast of bird, are impracticable in flat reproduction. The glossy sheen and tender depth are not available on paper. Otherwise the glories of amber and chocolate, yellow and violet, electric green and brown, might be less disappointing.

On the Mixture of Colours.—The common definition of *white* is that it is the presence of all the colours, and of *black* that it is the absence of all colour. It is true, theoretically, that the mixture or combination of the colours of the prismatic spectrum, by means of a lens or concave mirror, produces a ray of white light; but when pigments or inks, representing those colours are mixed, the result is not white, but gray or black, according to their intensity, etc.:

For every blue ink contains also either red or yellow;
Every red ink contains also either blue or yellow;
Every yellow ink contains also either blue or red;

And although the union of the blue, red, and yellow of the spectrum produces *white*, the union of blue, red, and yellow inks produces gray or *black*, according to proportion.

If inks were in colour as pure as those of the spectrum, their mixture would also yield pure colours.

Ultramarine is the only ink which approaches a prismatic colour in its purity, but even that has a slight tinge of red in its composition, causing it to appear violet.

Take gamboge as the representative of pure yellow, carmine as that of red, and Prussian blue as that of blue.

In mixing inks to obtain pure secondary colours, a better result is obtained if we select such as are free from the colour not essential to the compound. Thus, to obtain a pure green, which consists of blue and yellow only, take a blue tinged with yellow rather than with red, and a yellow tinged with blue rather than with red; if either of those inks is tinged with red, a quantity of black would be formed by its mixture with the other two primaries, and the green would be tarnished or broken. So long as pure blue and yellow are mixed together, in varying proportions, but without the addition of the other primary colour (red), the resulting compound colour, green, remains pure. Such is the theory, and the practical result is the same if the inks selected to form the mixture are both free from the third primary.

When the three primary inks are mixed together in equal strength and proportions, the resulting compound is black. But if they are mixed in unequal strength and proportions, the mixture is gray, coloured by the primary or the secondary in excess in the compound.

Normal gray is formed by mixing a black with a white ink in varying proportions, producing various tones of gray.

By adding a primary or a secondary to normal gray, a coloured gray is produced.

There are as many classes of gray as there are primary and secondary colours, and as many hues of gray as there are hues of these pure colours. What are commonly called tertiaries, are, in fact, coloured grays: thus, russet is red-gray, citrine is yellow-gray, olive is blue-gray.

If the primaries are mixed in unequal proportions, or are of different intensities, the mixture is a gray.

If blue is in excess, the mixture is a blue-gray.

If red is in excess, the mixture is a yellow-gray.

If blue and red are in excess, the mixture is a violet-gray.

If blue and yellow are in excess, the mixture is a green-gray.

If yellow and red are in excess, the mixture is an orange-gray.

When two secondaries are mixed together, the gray which results is coloured by the primary which enters into the composition of both secondaries.

The Use of Tints.—In no department has there been more marked progress during the past few years than in that of colour printing. The origin of printing in two or more colours seems somewhat obscure. Ancient specimens of press work are to be found in which ornamented coloured initials are worked with the text; but many of these appear to have been the handiwork of the scribe rather than of the printer. Much of the colour printing of the past consists of attempts at showy effects, in bright or positive colours; but in later years, especially during the past decade, the printer has aimed at harmony of colouring, as well as brilliant effects, so that in this direction great advancement has been made. The principles of artistic colouring are governed by laws, and their observance is necessary on the part of the printer as well as the painter. The latter, however, has the advantage of the printer, because he can apply his colours with the brush in any required degree of intensity, changing and substituting until the eye is satisfied with the effect; while the printer must, to a great extent, carry his plan in his mind's eye, and judge beforehand of the effects of his colours and the harmony of the whole, even before one of them is applied to his work. The necessity for an understanding of the laws of colour by the printer will, therefore, be apparent, and he who would be successful should comprehend at least the simplest principles of harmony and contrast in colour. The employment of tints in the production of fine effects in colour work is becoming a necessary part of the printer's art. These tints are employed either to heighten the effects of single lines or groups of lines, or to serve for a background for portions of the work. In either case great care is required to obtain harmony of colours; the safest tints are those in which the primary colours do not appear, such, for instance, as drab, buff, etc. It is safe to say that for a groundwork of much surface, a primary colour can seldom be used with good effect. When the type-work is in several brilliant colours, the tints should always be subdued and quieting in their effects. Where a single tint is used as a groundwork for the text, its colour should be made to depend on that of the ink used for the text. If much black, blue, or other dark ink be used, the tint may be warm, such as buff,

orange, pink, or purple. If warm colours are used in the text, a cool tint, such as drab, gray, or slate may be employed, always seeking to preserve a balance and harmony in the whole. An effective tint, especially if it be light or pale, should have a well-defined boundary of a deeper colour than itself. This is accomplished by working a tint to fill a prescribed space, defined by rules or border, in which case accuracy of register is a requisite, because the tint overrunning or falling short of the boundary would present an unsightly appearance.

Dividing the Ductor for Colour Work.—To make a good, cheap and serviceable fountain division for working two colours at once: Take a piece of hard soap and cut as near the shape and size of fountain as possible, push down to the fountain roller and friction will soon fashion the soap to hug the roller so nicely that all danger of the mixing of colours will be overcome.

Registering Colour Formes.—Various suggestions have been made concerning the method of making-up formes for two-colour work. An excellent and widely-known device is to take a pull of the key forme, lay it face downwards on the stone or galley, and saturate the sheet with oil, thereby rendering it so transparent as to show up the main design. Some one recently hit upon a quicker and cleaner method. Instead of pulling a rough proof in the ordinary manner, the plan is to sheet a roller on a sheet large enough to cover the forme. Place a clean sheet on the forme, with the inked sheet face downwards above it, and take a pull. The result is a complete set-off of the key forme which is forthwith ready for use as a guide in building the colour forme. When several sets of electros are being mounted to one design, one inked sheet will be sufficient to give several copies. Should the key forme be gone to press, a special set-off can be pulled either from a miss on the cylinder, or from a freshly printed sheet arranged for the purpose. While an oiled sheet serves its purpose very well, it is sometimes objectionable to handle; and the method just explained is certainly better, if only on this account.

How to Register Two-Colour Work on the Machine.—This is a method of handling intricate two-colour work. Take a quarto page as an illustration, containing a close-fitting initial and some point-rule underlining. Many compositors, when called upon to register on machine, without any thought unlock the forme, moving, for example, the initial just a trifle up or down, the same with the rule underlining, and after locking up, it is found that the register is still out. The forme is unlocked again and again before the fitting is perfect. If trouble had been taken to push side and footsticks close up to chase or furniture, to lock up the forme gently, and, after an impression has been taken, having to unlock again, to mark the position of each quoin on chase or footstick, always driving quoins up to the marks, it would have been somewhat simplified. A small forme, if properly justified, should lift by merely pushing in the quoins with the fingers. Many compositors when making up a two-colour forme do not allow of a sufficient number of leads each side of the lines in the colour forme for registering. This is a great mistake, especially when, in the case of large offices, the machine-room is some distance away, for it is very annoying to any one who is endeavouring to get register to have to keep running backwards and forwards to break furniture. There should always be at least a couple of leads before and after a line to allow for registering. Too many leads will, however, render the forme springy.

Mistakes in Colour Printing.—It is well known that in all colour work, especially theatrical, show-card, and label work, where but four or five printings are required, the colours are mostly printed in the following order: Yellow, red, black, blue, and if a fifth colour is buff, this comes last. This order is invariably followed, except when it is desired to have in the four or five printings a brilliant green or a good purple. It is impossible to produce a warm brilliant green if yellow is printed before the blue, and it is the same with purple. A blue over red never makes as fine a purple as when the blue is printed first and the red over it. A chrome yellow printed first and a milori blue

upon it produces a cold dark green against a warm brilliant green obtained by reversing the order. Milori blue over vermilion gives a dark dirty brown, over crimson it forms a cold, dark-bluish purple; dark blues, such as Prussian, bronze, and indigo, over vermilion produce an intense black, against which a true black appears decidedly gray. Prussian blue and bronze blue printed over crimson lake appear as a very dark, almost black-bluish purple, while the lake printed over blue gives a true purple. The best and brightest purple obtainable by printing red over blue is secured by cobalt blue and carmine lake. The brightest green is produced by milori blue first and light chrome yellow over it.

Working of Blue and Green.—If the best results are desired with blue ink, especially ultramarine, as well as the more brilliant greens, do not use hard rollers, nor glycerine rollers. Use good fresh glue-and-molasses rollers, and do not carry too much colour. It is common to notice a mottled or speckled appearance in solid blue surfaces. In other cases a stringy appearance is seen. This indicates either too much moisture or too much oil in the rollers—a simple matter, but one to be watched with care.

Hints on Three-Colour Printing.—Trichromatic or three-colour work has now proved its commercial value. Such being the case, all printers should strive to excel in this, the most exacting branch of printing. The many troubles which beset the ordinary printer undertaking three-colour will vanish if he adapt himself and his plant to the following modes of working: First of all, see that the room in which the work is to be produced is kept clean; also see that an even temperature of 60° is maintained both day and night in order to avoid the stretching of paper. Keep in this room a supply of the most used art papers for some weeks, and hang up in clips for a day previous to use, if possible. If convenient have three two-revolution cylinder machines of exactly the same cylinder dimensions and the same number of revolutions per hour; also a platen machine of the best class. When ready, place the yellow forme on cylinder machine No. 1,

and give this machine a day's start over the red, No. 2 machine, and the blue, No. 3 machine, start a day after No. 2. This will give to the ink the conditions needful for satisfactory work. Upon the platen machine place the blue plate, and have a pull from the red on yellow to try a sheet on the platen in blue. This will help far more than any engraver's proof, and any alterations can be made in the red and blue which could not be made if the red and yellow were finished before the blue is running. An important point in three-colour printing is to make certain that the grippers and sidelays are set fast. See that the grippers take a firm hold, and that they grip about two-and-a-half inches from each end of the sheet, the space between being evenly divided by the other grippers. The grippers must fall on exactly the same place on each of the three machines; the sidelays must also fall in the same position on each machine, and on no account must they be moved. Allow slightly more yellow colour than appears on the engraver's proof of that colour, because in the first printing the yellow to a small extent is absorbed by the surface of the paper.

Making-ready for Three-colour Jobs.—This is much the same as for the average half-tone illustrations; but it is necessary to look ahead, by way of caution, when the yellow and red plates are being made ready; because if either of these are made ready too light or too strong, on some portions, the delicacy or combinations of colour, by overlapping, may be spoiled to such a degree as to destroy the pictorial efficiency of the subject. Artist's proofs of such work should be furnished. When this cannot be done, proving up the plates is advised—taking proofs in two or three tones of yellow and red—even more. Small samples of these tones of ink should be marked so as to correspond with a similar mark on the proof sheets; by this means the pressman will be able to intelligently duplicate the colour, when ready to go on with the printing. As the printing of blue plate over the yellow and red printed proofs show the relative strength and harmony of the picture, so will it also demonstrate just what portions of each colour plate should be made lighter or darker in order to get the best results. There are some so conversant with the appearance of colour

values on three-colour plates as to pass over this rule; but these men often fail in securing the ideal of the artist. Usually yellow and red plates, for tri-colour work, are not made ready as strong as the blue plate; from this it may be inferred that it is not essential that three-ply overlays be constructed for each colour. However, in making overlays or make-readys for two or more colours of press work, there must be a degree of relative harmony, because if one colour is over strongly made ready there is danger in losing one of its greatest essentials—register.

PRINTING TRI-COLOUR BLOCKS IN SETS.—There are two ways, and both satisfactory. First mount one lot, preferably the blue, in whatever position is desired. Then pull a press proof of this on either transparent celluloid or fine bristol board. In the case of the celluloid, lay the impression over the block and fit the cuts underneath; move them around until they are exactly in the right place. Then put the nails in without disturbing the cuts. In case of the bristol board, lay the impression face up on the imposing-stone. Put a little glue on the backs of the cuts. Fit the cuts, face down, in contact with the impression, then lay the block over them. Put a weight on top until the glue dries. When this is done, put in the nails, and the cuts will register to a hair. Some put a touch of paste on the face of the cut before fitting to the cardboard.

DISTINGUISHING THE DIFFERENCE BETWEEN THREE-COLOUR BLOCKS.—Screens for what is generally known as three-colour printing plates have a systematic scale to follow whereby the very best of effects may be obtained, by which is meant that to secure accurate colour, value, and harmony, as well as precision in register, the direction of the screen lines should vary, so that those in the yellow plate run parallel across, from right to left; those in the red and blue running anglewise, the red and blue lines separated exactly the width of the screen line employed. By such a scale the extreme lights in colour are rendered clear and exact, so that where shading, partial lapping or entire covering of superposed colours are necessary to produce combinations of various tones and colours, all these

lines are so made as to perform their essential functions with artistic and mathematical precision. From this any one should be able to distinguish the yellow plate colour readily. In the case of the red and blue plates, usually the angled lines of the red appear first at the top of the plate and running anglewise to the left when printed, while those of the blue run the reverse way. It is often found necessary to have the lines in the yellow plate run parallel up and down instead of across from left to right; therefore also note this difference in the identification of yellow plates.

Iris Printing.—The best effects of iris printing are obtainable in subdued tints, especially when such printing forms the groundwork for one or two other colours. All the hand-press printer has to do is to distribute the colours on the hand roller, and keep the roller always in motion in one direction when applying it to the stone. A dark tint, fading to nothing, is accomplished by adding varnish to one end of the roller and colour at the other, working them on the slab till they meet, thus forming a soft, graduated tint, from the darkest to the lightest shade, and all in one printing.

Complementary Colours.—All colours have their complementaries, which add to or detract from the beauty of the adjoining colours, according to what they may be. Thus, the complementaries of red are green; of blue are orange; of yellow are violet. If any one were to cut out pieces of gray paper in an ornamental form, and stick a piece on each of the three colours named, it would be found that in a shaded light the gray was fully tinted by the complementaries of these colours. But precise rules cannot be laid down. An experienced artist can bring any two colours together by properly modulating them. Nothing is so charming and so refreshing to the eye as an harmonious arrangement of colours. They are like a sweet chord of music to the sense. The hand of nature never errs, whether it brings together scarlet and crimson, as in the cactus; scarlet and purple, in the fuchsia; yellow and orange, as in the calceolaria; or the colours in the varied plumage of

exotic birds—the harmony is always beautiful, ever perfect. The laws of harmonious colouring are a necessary part of the knowledge of the manufacture of coloured fabrics. These are a few contrasts: 1. Black and warm brown. 2. Violet and pale green. 3. Violet and light rose colour. 4. Deep blue and golden brown. 5. Chocolate and bright blue. 6. Deep red and gray. 7. Maroon and warm green. 8. Deep blue and pink. 9. Chocolate and pea green. 10. Maroon and deep blue. 11. Claret and buff. 12. Black and warm green.

A Colour Printing Machine.—A German firm has patented an improvement in platen machines with oscillating table, by which it is possible to print in two colours without changing the inking apparatus. The present platen or the forme receives a second platen or a frame which may be revolved or displaced in the centre in an axis of the table. A suitable arrangement turns this second plate before closing the platen, or before it is pressed against the forme, by 90 degrees, and the same happens on the retirement of the platen. The inking apparatus is divided into two parts. If only one colour is to be printed, the two parts are pushed together, and thus form a single inking apparatus. The same is the case with the inking rollers.

Printing Solid Black on Gold.—A plate made of metal, and perfectly free from small holes will suffice, but a polished zinc plate, cut to the required size is the best. Boxwood blocks are not so suitable for long numbers, frequent cleaning causing the surfaces to wear rough. The bronzing preparation must be one which dries well when covered with gold, but does not dry so quickly as not to allow sufficient time for the bronze to be carefully laid on. A bronzing preparation is recommended to all who have bronze work to do. A large pad of cotton-wool must be used for laying on the bronze, and as the sheets are finished they must be laid perfectly straight until dry. Surplus bronze may then be dusted off with an old silk handkerchief without any fear of scratching the gold surface. Blue-black is the only ink which prints solid black

on gold at one impression. Printers will, however, experience some difficulty in getting the work to look black and solid without overloading the forme with ink. The whole process is slow and tedious, and one which refuses to be hurried, but the finished effect is fine and it repays the trouble. The forme, if a fairly solid one, showing large masses of black, should be double-rolled, and the machine run very slowly—so as to give the machineman time to peel the sheet from off the forme for every impression. This may be done easily by moving the grippers clear of the sheet and allowing the latter to adhere to the forme; a quick grip of the sheet with both hands just before the rollers descend will suffice to peel the sheet from off the forme, and prevent the "lifting" of the gold surface, which must result where grippers are used to pull the sheet from the forme.

Vignetted Half-Tones.—If the first pulls of the block exhibit hard edges, remove the plate carefully from the block by drawing the tacks with a pair of pincers—do not prise it off with a screw-driver and bend the plate. Then examine the block to see whether it is low in centre; if it is, build it up or plane the edges down, and also try the plate with a straight-edge to see that it is perfectly flat. Then with a medium coarse file remove about the thickness of a cardboard from the edges of the back of the plate all round, tapering the edge back toward the centre nearly a quarter of an inch. Then re-tack to block and use a rubber-faced planer to plane it down. This will lower the edges so as to produce a gradually lessening impression. If the outline of the plate be very irregular the lowering may be facilitated by cutting nicks in the flange or shoulder here and there to avoid any chance for buckling. Having now a naturally vignetted plate, the next thing is so to adjust the rollers that they bear only hard enough to ink the centre and barely touch the lowered edges. This requires care on job presses, or on presses where the roller sockets are much worn; but the roller pressure is the point where most pressmen fail, more on half-tone work than any other. If the rollers strike hard against the edges of the plate one cannot expect to get clean vignetting which fades off

into the paper. Attend to these two points before doing any make-ready, beyond levelling up the cuts to type height, and it will be surprising to find how little there is left to be done by overlaying.

Printing in Bronze.—The whole secret of brilliant bronze work is to have the sheets rolled after printing.

To make Bronze stick.—Those who have trouble in making bronze stick when dry should try a little mucilage or liquid glue in the size. Mix only a little at a time, and wash up frequently or the rollers and disk will become too stiff to work.

A Finishing Touch to Bronze Work.—This method is applicable only where the bronze forme consists of an electro or brass rules. Make the forme ready and proceed as in running any ordinary work of this kind, possibly using a little more size than usual, and follow it up with the regular bronzing process as fast as possible. This is an important point in bronze work. Frequently machine-men allow too many impressions to accumulate before the powder is applied. Use great care in the selection of the powder, as there are many shades in gold bronze—varying from an old copper effect to a deep, mellow, and lustrous gold. It is always well to follow up each process in bronzing as rapidly as possible; it will be better, if it is a long run, to get a duplicate electro of the forme running in size, to put on another machine for the gold-leaf-effect process. Make this latter forme ready as in the other case, remove the rollers, and all is ready to proceed. If gas is being used, have a jet lighted within easy reach; or a lamp will do where gas is not available. Hold the duplicate electro or rule forme over the jet just long enough to bring the metal to a point of temperature where it is scarcely bearable to the touch—not too much heat, however, as it does not take a great deal to damage the metal. A temperature which will barely allow the hand to come in contact with will do for a 200 to 500 run, when the process must be repeated. Take the bronze sheets while they are fresh, before dusting (this is essential), and run them through the machine with the heated electro. Just

the slightest warmth and a rigid impression will cause a perfect cohesion of the metallic particles in the powder, and the effect will be surprising. All the loose particles which give a rough effect will entirely disappear, giving a smooth, brilliant appearance, even on rough paper. The dusting can be done last, and it will be found that this process will only remove excess particles, instead of dimming the bronzing, as is the case when the ordinary method is followed.

Bronzing on Plated Papers.—Pressmen frequently find that they cannot print plated papers in bronze with success. The heavy coating on the paper absorbs the size so that the bronze will not stick. This can be obviated by running the sheets twice through the press, using size both times, and allowing it to dry after the first impression, which it will do very quickly. The first printing fills up the pores in the paper, leaving an excellent ground for the second impression, to which the bronze will adhere firmly. Of course this is expensive; but it must be allowed for in estimating the cost of the work.

Bronzing after a Colour has been Printed.—Calcined magnesia rubbed on a job will allow of bronze being printed over colour without adhering to it, but the colour should be as dry as possible before applying the magnesia.

To print Solid Tint Blocks.—To do this properly they must first be made ready on a machine which has strength, good roller distribution for all grades of inks, and sufficient forme roller accommodation to cover with colour any forme adapted to its capacity in size and other essentials. The make-ready should be fairly hard, and the block brought up to the face of the forme by careful underlaying. A fairly well-seasoned set of rollers should be employed to distribute the ink and cover the forme well and evenly. In most cases inks are reduced with a thinning varnish, put up for printers' use by any reputable ink maker, and for just such work. Tint inks are generally made with white ink and varnish, and a small quantity of the colour desired for use. Such ink should not be too thin, that is, too much varnish must not be added.

Printing on Tin.—The impression is first made from the stone on to a rubber roller, and from this roller is transferred off again upon the tin plate. A steam press working on this system has been invented. The rubber has the quality of taking a much sharper impression than any kind of paper, and by its elasticity prints smooth and solid on a hard surface even if the latter is uneven.

Printing on Tin-foil.—Put gum arabic in vinegar and let it stand until it becomes a heavy paste, then mix in with ink as varnish.

Printing on Xylonite.—A New York firm announce that they are prepared to furnish the trade with indelible inks for printing on xylonite. These inks are said to be so prepared that they can be successfully used by any printer on an ordinary printing-press. There are twelve distinct colours, which are put up in one-pound cans. Xylonite ivory being a very attractive and durable material for advertising and display cards, it is believed that these inks will prove of great advantage to the trade. Hitherto xylonite has been printed upon by an expensive process, heat and pressure being necessary in connection with steel plates; but by the use of the new indelible ink this is overcome, and the xylonite card is placed within the reach of printers having only an ordinary outfit.

A Hint for Printing on Xylonite Cards.—In printing on this material, the sheets may be first slightly damped with alcohol, which dissolves or softens the surface and allows the ink to soak into the celluloid.

Printing on Vellum.—If this material is hard or stubborn, have it interleaved between damp paper, thus rendering it more fit for taking the impression. It is also said that no difficulty will be experienced in printing on vellum if it is first sponged over with soapy water.

Printing on Glazed Surfaces.—It is well known that printing ink when used on glazed and enamelled paper dries rapidly and pulverizes easily, so that the work is more or less rubbed off. This is due to the fact that the

paper absorbs up to a certain point those elements or substances which enter into the composition of the ink and whose function is to bind together the solid elements. In consequence of this absorption the colour or lampblack rests like dust on the enamel and rubs off naturally with great facility. To obviate this inconvenience recourse is had to two different methods: either to modify the paper used or to add some ingredient to the ink which will cause it to adhere better. The latter is the preferable course, for it is the simpler. For printing on glazed or enamelled paper add a varnish rich in resin, such as is used for bronze-work. This causes the colour of the ink to be somewhat deteriorated, but if care be taken there is not much to fear.

Stereotype or Electrotype Formes on Machine.—Trouble with stereotype or electrotype plates often results from bad and low letters not having been marked in proof. A forme for stereotype plates is treated by many just the same as one going to machine, instead of taking as light an impression as possible so that the reader may detect anything faulty. A soft impression is generally the cause of the evil. When machine proofs are submitted low letters are detected, and if too low to patch they must be altered, although this means the stoppage of the machine, which should never occur if it can be at all avoided. The best suggestion in regard to proof pulling is the use of a stout piece of pasteboard which should be used for all proofs—besides giving a fairly hard impression it also prevents rules cutting through the tympan, a very common occurrence where a number of compositors are engaged. With the cardboard type-high gauges should be used and the impression screw left severely alone.

Printing Red Ink and Electrotypes.—The following plan answers well for temporary purposes: Take one ounce of prepared gold size, and a quarter of an ounce of the "lake-brilliant" of Cornelissen, and grind well together with a muller; roll the electro with this preparation and let it stand for twelve hours, when it will be found as hard as stone, and the vermilion may be printed from the plate without the least injury to its brilliancy.

Printing Envelopes.—To prevent the lumpy particles of mucilage on gummed envelopes from battering the type, use a heavy piece of blotting paper as a tympan, and when too much impressed, touch the low part with a drop of water, which will bring up the impression again.

The Way to print Envelopes.—When a person opens out a box of envelopes, then prints them, then closes them and puts them back in the box, taking up double the usual amount of time, he has either very little to do or does not understand his job. Many printers never open envelopes in printing; largely because they were not taught to do so, but they probably would if they realized how simple a thing it is, and how much better printing can be done without the slightest loss in time. In short runs there is a saving of the time spent in make-ready. Lay two or three bunches of envelopes on the feed board, flap up, with the open side of the envelopes from the operator. Run the thumb under the flap while picking up, giving it a slight jerk to straighten it out as it is put in the press. In taking it up with the left hand draw it off exactly as one would a postal or larger card and the thumb will close the flap. Lock up the forme in the usual way and then reverse the chase in putting it in the press; this will bring it in the right position for printing.

How Blotters are Printed.—Printing on blotting paper presents several difficulties, and the trouble which is found in the printing lies in the fact that the absorbent paper does not lift the ink, the impressions appearing gray, broken, and at the same time filled up. The machine upon which the printing is done gets full of paper-dust to such an extent that the ink upon the rollers becomes pitchlike and the press itself is injured materially, as the fine dust enters all oil-holes and the machine, becoming dry, is subjected to unusual wear. Taking this into account, a few hints respecting such work may be useful. It is well known that the upper surface of blotting paper differs materially from the lower, the one being quite smooth and the other far more open and woolly. Again, it should be taken into consideration that the paper, when stacked, presents these

surfaces in changing order. Therefore, some one should be charged with arranging the paper with the smooth side up, which is best for printing. It may also be said that upon paper of the kind in question a solid and sharp impression can only be made when a hard, smooth, and even cardboard is placed on top of the rubber blanket on the cylinder. As most of the dust comes from the trimmed edges the paper should be dusted at the edges with a hard brush before being placed ready for printing.

To Print Process Blocks.—Some printers do not like process blocks, because they become clogged with ink and require frequently to be cleaned. This is one of their defects, and must be submitted to whenever there is anything more than an outline drawing. Much of the difficulty in printing can be obviated by using nothing but hard paper in the overlays, care in rolling, and a firm paper to be printed on. The fibres will not then sink into the plate and the ink spread over the portion in relief. Extra care will obviate nearly all trouble from this source.

Underlaying of Blocks before inserting in Matter.—In setting up a catalogue or other work containing illustrations, all blocks should be made just type-high, and this ought to be seen to by the clicker, or handed over to the pressman before giving out to the compositors. This will be found a great saving of time. Of course it is understood that blocks too high must be planed to height.

Hurried Work.—Some customers try to impress upon one the supreme importance of their work and urge one with all the power at their command to have every other work on which one may be engaged set aside in order to give their work the precedence. But the number of customers who are willing to pay what this procedure always costs is limited, and there are few who, when they are charged what is only a fair price for such high-pressure service, do not feel that they have been made victims—that their necessities have been made the excuse for exorbitant overcharge. Every time that a piece of work is interrupted means a loss. Probably the greatest item of extra cost that is entailed by rushing work through is the incessant supervision which

it is necessary to exercise in order to make all those multitudinous connections essential to getting it out in time. And while this superintendence is going on the manager is doing nothing else, and his routine work is piling up to make it that much harder for him when he gets back to it. When everything is taken into consideration, what with the disarrangement of work in the composing-room and the lifting of formes on presses and the general hustle and rush, printers seldom get what they are entitled to for hurried work, and as for getting anything extra for wear and tear on the nerves, that seems to be out of the question.

CLEANSING FORMES AND ROLLERS.—A suggestion, calculated to be of considerable service in printing, is the use of oil of camphor for cleaning rollers, type engravings, and lithographic stones. It is preferable to oil of turpentine, being without its unpleasant smell, and containing no greasy substance; nor does it leave any deposit on the article cleaned.

THE WASHING OF FORMES.—Nothing surpasses the lye from wood ashes for washing a forme. It is clean, takes hold easily, and is completely dislodged by the application of water; common potash does not make a good lye, as it is too dirty and uneven; concentrated lye, as sold by printers' furnishers, is also uneven in quality, and is generally too strong. The compound should not be so strong that an accidental drop on the back of the hand would raise a red spot before it could be removed. A lye rather weak, but abundant in quantity, should be sought, and it ought not to be used over and over again with ink dissolved in it, as it often is. The brush can be used too much, thus injuring the type. A good deal of water is needed to remove the alkali. When the forme is laid up, if the type is slippery the lye has not been properly washed off, and if the fingers become dirty in distribution it is from bad washing. An infallible indication that formes are not taken care of is a piece of alum in the men's cases. This is used to corrugate the skin on the fingers, so that the type may not slip away too easily. In some offices the lye is frequently allowed to penetrate the page.

Dirty Type and Blocks.—Type which is badly filled up with old, dried ink, will frequently give the appearance of a slur, the accumulated ink in and around the letters receiving fresh ink from the rollers and in turn leaving some of it on the printed sheet. The first thing to do in making ready such a forme, is to clean it thoroughly with good lye. The filling up of cuts and type is a source of constant aggravation. The most common causes are poor cleaning of the press, gritty or skinny ink, too much impression, too soft a tympan; and last, but not least, cut up rollers, from the cracks in which little particles of roller-composition are constantly working into the ink and thence into the cuts. The remedies for each of these causes are self-evident. It may be well, however, to say that even with good rollers, good ink, and the greatest care, it is still good practice to clean out half-tone formes every one or two thousand impressions, if clear, sharp work is desired. Cuts are sometimes filled with old, dried ink which will not come off with lye, benzine, etc., and which, especially in half-tones, gives the plate a dull, muddy, or worn-out appearance. If such cuts cannot be cleaned with the ordinary materials, use alcohol in which has been dissolved as much as it will hold of white caustic potash. Do not scrub with it as with lye, but simply float enough over the cuts to cover the surface of it, and clean it off after a minute or two. It is enormously powerful in removing ink, but will not injure type or cuts if used as suggested.

Dirty Tapes on Machine.—A great drawback in rotary machines is the liability of the tapes to get dirty. In the first place, the use of ink containing a sufficient proportion of varnish is recommended. The latter may be dearer, but it is more economical. In the next place, thin tapes are suggested; if they are not drawn too tightly they last quite as long as thick ones.

Damage to Rollers by Brass Rule.—In working brass rule formes, to prevent as much as possible the rollers from being cut, place broad wood rules inside the chases, so as to act as bearers for the rollers the whole length of the forme. The ends should be rounded or tapered, in order

to prevent damage to the rollers when rising on to them. They should be longer than the formes, and must be placed exactly parallel with each other. For open or light matter this will be found an excellent plan, as the inking will be more even than when rollers are left to bump over the matter. Strips of paper must be fastened to the cylinder or platen for these rules to work on, and should be changed as required.

To Prevent Angle Rollers Chipping.—Make a solution of alum, say one tablespoonful of powdered alum to a cup of water. After washing the angle rollers perfectly clean with lye and water, wash about seven or eight inches on both ends with the solution. After standing a short time, the parts treated will be found dry and without suction. Alum, being an astringent, will make the ends tough. This will also work like a charm in damp, wet weather, when troubled with soft, sticky rollers which refuse to take ink. It is not advisable for forme rollers, except in case of getting badly stuck with sticky rollers. Use a weaker solution for them, say one teaspoonful to a cup of water; exercise judgement in its use; try it on one roller first. If it makes the roller too dry, try less alum. It is important that rollers should be perfectly free from ink or grease before applying the wash. It is a well-known fact that oil and water will not mix, so where grease spots occur, the wash will not take, hence a roller is mottled with dry and sticky spots. This little wrinkle has been tried on angle rollers with good results.

A new Perfecting Machine has been patented in Germany. In this machine two simple rotary motions have been combined, so that only one motor moves the two formes and the two printing cylinders. The sheet, after being printed on one side, is turned by a turning drum during the return of the carriage, and then printed on the other side during its next forward movement. Both the prime impression and the reprint are consequently effected during one passage of the carriage on two sheets. It follows from this arrangement that the two printing cylinders are not continuously revolving, but are arrested dur-

ing the return of the carriage, as in ordinary machines, by an intercepting fork. The sheets may consequently, during this pause, be pressed against points. The machine delivers for each turn a perfected sheet, with the exception of the first and last turns. In the former the reprint cylinder revolves without printing; in the latter the prime cylinder turns without doing work.

A Method of Embossing.—For those who have not attempted embossing upon an ordinary platen press, the following instructions are given, but embossing cannot be hurried in any degree. Suppose that a single line is to be embossed. First select the line to be brought into prominence. Set it in some plain, heavy-face type. Space the line tightly, for the least shifting of the letters after the start is made will be fatal to the entire effect of the work. Print the line the same as if it were to be a plain colour job, then lay the printed sheets aside for a sufficient time for them to become thoroughly dry. Let the line printed from remain locked up in the chase. Lay a piece of smooth cardboard on the ink disk of the press until the rollers evenly and thoroughly cover it with black job ink. Then fasten the card upon the platen so that it will not shift. Place the chase containing the line of type on the press, and with rollers removed, take several heavy impressions on the board, wiping the type clean with a rag between the impressions. Get a piece of smooth surface zinc, and cut the cardboard upon which will now appear the line of type in white, or nearly so, to the size of the zinc prepared, which is for the female die; place the card upon the zinc, face down, and go through the same operation as in transferring cuts for engraving. Give the transfer on the zinc a dusting with dragon's blood; heat, varnish back and etch, the same as for plain cuts. In this instance the letters will appear sunken instead of raised. In some cases better results may be obtained by tracing round the letters with drawing ink, using pen and brush, leaving the letters showing bright, before dusting with dragon's blood and proceeding with the process. After etching to the depth of a sheet of thick paper, mount the plate, and the female die is ready for embossing. In deep etching the zinc will have

to be removed from the bath several times, cleaned, retraced, and treated as in the first operation, as the deeper the etch, the more liable the acid is to cut in under the letters and thus make ragged work. When both dies are ready, one locked in the chase of the job press and the other upon the draw sheet of the platen, take the sheets already printed, now thoroughly dry, and after securing register, with rollers removed from the press, run through slowly and with a heavy impression. If the instructions have been followed the result will be satisfactory. Beginners should try a single line or word in plain Gothic type in first attempts.

Another Method of Embossing on Platen Machines.—Mount the zinc or brass die on a metal base, if possible, and pull an impression on the packing, which should consist of one sheet of heavy manila card such as tags are made from, pasted to the platen. Then cut strips of blotting paper of good thickness a little wider than the lines to be embossed—as many strips as there are lines—and soak them in a solution of silicate of soda until saturated; coat the place they are to occupy with fish-glue and place the strips, still wet, in place. Over these put a sheet of oiled tissue and run up the impression, holding the machine on the impression for a minute or so. Then pull again on a sheet of paper somewhat thinner than the stock to be used. Allow the counter or force thus formed to dry, occasionally pulling an impression or two to keep it sharp. Drying can be hastened by dusting the counter with powdered French chalk between the pulls, which will also increase the hardness of the counter. The proper strength of the silicate of soda solution is equal parts of water and the syrupy silicate as usually sold by chemists. This method will not answer for dies containing very fine surface cutting, but is excellent for type-work where zinc-etched dies are used. Care should be taken not to strain the machine by attempting work beyond its capacity.

The Printing and Cutting of Labels.—To trim a circular label quite close to the enclosing rule: Get some steel cutting rule, and with the help of a curving machine

first bend a lead so as to fit the rule closely; then bend the cutting-rule to fit round the lead, leaving a very small space (say one-sixteenth of an inch) between the ends; when fixed put the forme on the press; use a *hard* tympan (Bristol board is good), and after making ready put an overlay of cardboard over the cutting-rule. It will be found that the next impression will print the label and at the same time cut it smoothly and neatly from the sheet, except where the space comes between the ends of the rule. This small uncut space serves to pull the sheet from the type, and if the sheets are fed accurately they may be knocked up straight and square and the paper cutter used to separate the narrow uncut space, or a thin chisel may be pushed through the pile. If these directions are followed, labels of any shape can be printed with narrow or wide margins, of uniform width all round, and without waste of time. On odd shapes, where the cutting-rule has to be fitted in sections, it is best to use the soldering iron to keep them in place. The same device may be used to cut cards to odd shapes by fitting the rule to the shape desired, and running cards through the press without rollers.

A Set-off Paper.—Pressmen should remember that paper saturated with benzine is as good as, and much cleaner than, oiled paper, to avoid a "set-off," when work has to be printed on both sides.

Set-off Sheets.—A sheet of paper wet with glycerine and used as a tympan-sheet will prevent offsetting. This will be found better than using oiled sheets.

How to Centre a Sheet.—The quickest and best way to centre a sheet in setting gauges on the platen is first to mark the width of the page or matter on the sheet—placing one edge of the sheet to the edge of the matter—and then fold it to the mark; then fold it exactly in the middle of the sheet. The space between the creases left by these folds will show the exact margin, and it is only necessary now to lay the sheet on the tympan and mark the place for the gauges. This rule applies to either the side or bottom gauges. To get the sheet straight, find a straight line in the forme running lengthwise of the platen and

mark it on the sheet, first having laid the sheet to the margin thus ascertained. Then carry the sheet along the line to the places desired for the bottom gauges and mark. Should there be no line long enough thus to straighten the sheet, overlapping lines may be used by making extra marks, or one of them lengthened with a straight-edge and pencil. It is generally safe, however, to square the sheet to the edge of the platen. While sheets can thus be centred and squared with comparative trueness, there is always a chance for deviation from the line in making the mark and setting the gauges, and, no matter how slight this may be, it should be corrected. Adjustable gauges—those which can be regulated after they have been secured in the tympan—are indispensable in getting the sheets exactly true.

To Ensure Register.—When seeking the cause of defective register ascertain if the grippers have a uniformly firm hold of the sheet alike on moving to and leading from the forme. Should either gripper hold tighter than the other, there is a possibility of the sheet "drawing" a little, with consequent slur and inaccurate register.

Paper Shrinkage and Register.—A practical printer having a lot of valuable paper which had shrunk through change of temperature when only partly worked on a colour job, closed the press-room tight and made a good hot fire in the stove. The sheets were then laid in piles of fifty to a hundred on racks, and the edges of the sheets placed towards the stove. The racks were turned and transposed at short intervals, and measured about every half-hour. When a batch of sheets had shrunk to the normal, they were printed at once. The whole process consumed about five hours and saved the job. The lesson taught by this experience is never to work a sheet of paper that requires absolute register the same day as received, whether it be from the local paper house or from a distance. The atmosphere of the warehouse may not tally with that of the shop. Let it lie over in the press-room, well spread out, at least a day and a night, turning it at frequent intervals, until it has become thoroughly acclimatized, before running it.

To Work Headings at Press.—Having the paper ruled to the desired pattern, set up the type so that it will register in the compartments of the ruling prepared for it. Then make ready the forme and lift a sheet in, as near register as possible on to the tympan of the press—it is difficult to work headings properly at a cylinder machine—then get some very long darning needles, the longer the better, and stick them firmly into the tympan so that they are flat to the paper. These needles, if stuck (as one sticks pins) for laying the sheets to, will guide the register, as they must be so placed as to hide lines of the ruling, both at the off side and bottom side of the tympan.

The Care of Press-Room Tools.—Why is it that the average printer takes such poor care of the wrenches and tools furnished with his press, and in fact with the small parts of the press itself if they are detachable? A monkey-wrench or even a solid wrench soon becomes untrue and useless if used as a hammer, and the screw-driver makes a poor chisel or crowbar. A pressman should take a pride in keeping his tools in good condition, and every press-room should have racks provided for wrenches and other tools not in actual use. The saving in tools in a year in some of the large offices would more than pay for the racks.

Barking the Knuckles.—In washing small job formes with benzine after taking proofs, printers find it provokingly easy to scrape the skin off the knuckles while driving the small brush generally used across the forme. One who has tried it says that the cause of knuckle barking is the smallness of the brush, and that after taking into use an ordinary boot-blacking brush he saved his skin.

What Vibration Does.—Vibration is the great bugbear of the business. It is governed by fixed laws, of course, but they are so subtle and intricate that it is next to impossible to master them. They have a most important bearing, however, on the life of machinery. Valuable engines have been known to jar themselves literally to pieces for no apparent cause. Some slight error in adjustment had set up a vibration until the whole plant was affected.

A steady tremor of that kind will not only wear out the parts, but cause structural changes in the metal itself. Wrought steel will gradually lose its toughness and elasticity and become as brittle as cast iron. When it is fractured, the interior will have a strange, granulated appearance, and the worst of it is that the alteration may be going on for months without the knowledge of the most careful engineer alive. There are different ways of stopping vibrations, and one of the most curious is to set up a counter tremor in the opposite direction. One neutralizes the other.

To Lengthen the Life of Type on Machine.—The rollers on a cylinder machine play an important part in the longevity of type. They should be set as high as possible, and no more ink carried than is absolutely necessary to secure a clear print. A low roller soon crowds the ink into the open letters and between the lines, and then some one is blamed for not properly washing the formes, although well equipped with best type-wash and brushes. No end of trouble is experienced in endeavouring to get solid type on its feet which has a small quantity of ink on four sides —a direct result of low-set rollers and a surplus of ink. A fairly hard tympan not only allows of a sharp impression from somewhat worn type, but by preventing the constant indentation into a soft tympan, the daily rounding-off which tends to shorten the life of material is avoided.

How to Imitate Typewritten Letters.—To imitate the blur or slur of typewriting in printing, the ink is especially prepared for the purpose by the admixture of oil and aniline colour to match, and run between rubber rollers shortly after printing. Another method is to print with copying-ink and run the printed sheets through dampened rollers a few hours after printing.

Hints for Quickly Drying Printed Work.—It may not be generally known that ink will dry very quickly on paper damped with glycerine water. Posters with large and full-faced types will dry in a quarter of an hour, whilst the drying process, when the printing has been done on paper simply wetted in the ordinary way, will require hours.

To Work off Script Type.—To get the best effect from a forme made up of script type, select a good roller, one with "suction" or "tack," set so that in inking it just takes a slight indent from the forme. If one has but one size trucks, extra adjustment may be had by pasting strips of cardboard on the roller carriage frame. Use stiff ink and sparingly. Never use two rollers on a script forme if one will do the work. Set the impression low in starting, and raise it as required.

Machine for Varnishing and Drying.—To give labels and other bright-coloured printing matter a glossed and brilliant appearance it is necessary that they should be varnished. This has heretofore been the cause of trouble, because the sheets, after the labels were varnished, had to be spread out singly to dry; consequently a considerable space for drying racks was required, to say nothing of the delay in waiting for the work to dry, and the labour lost in handling the sheet. With a machine the work can be done with the same facility and dispatch as any ordinary printing is done. The sheets are fed to the glosser in the same manner as to a printing machine, and are automatically taken to a hot-air chamber in a drying-machine attached to the glosser. After travelling the length of the hot-air chamber, they are returned by an ingenious contrivance to another portion of the machine, and automatically conveyed through a cold-air chamber and delivered on a receiver, thoroughly dry in all their parts and ready to be handled. To work this interesting machine no more help is needed than an ordinary printing machine, while its capacity to gloss and dry is very great.

Wearing of Stereotype Plates on Machine.—Apparent wear on nearly all stereo plates is much in excess of what it should be with better make-ready and if the cylinder of the press is carried a little higher from the face of the forme, or less packing is used thereon. The excessive wear and rounding-off of the sides of the plates abundantly demonstrate this fact, for at these parts of the plate the surface of the letters is rounded and wholly worn down below the supports of the type face, while the centre of the

plate should be in fairly good condition. In the first place, stereo plates should be brought up to uniform printing height, because most of them show unpardonable defects, which should have been attended to in the make-ready, by cutting out high portions and building up low ones, so as to remedy any inequality apparent on the first make-ready sheets. After that important step had been taken, the detail of patching up make-ready sheets for the cylinder should be an easy one on such a forme. With skilful make-ready a forme of stereo plates could be made to work an edition of at least fifty thousand on a fair quality of paper. For larger editions electrotype plates are recommended.

Bearers.—Bearers on cylinder machines are supposed to assist in sustaining the weight of the cylinder and to make the bed and cylinder run in unison. From this fact some pressmen seem to think that bearers have some such office to perform on a platen press. Under very exceptional circumstances, such as a heavy cut worked considerably out of centre, or in using an old and somewhat shaky press, it may be necessary to use bearers on a platen press for the purpose of securing a uniform impression or preventing the press from slurring, but any advocacy of bearers which actually sustain impression, for the ordinary run of work on platen presses, is most pernicious. The function of bearers on platen presses is to ensure the rollers turning, both when they first touch the forme and as they run over it. Without them the rollers are likely to slide instead of rolling, especially before coming to the type.

Wall-paper Printing.—The printing of wall-paper is much the same process as used in the printing of a newspaper. A big drum, which reminds one of a country newspaper cylinder printing-press, revolves with the paper reeled from the web. Each colour is applied from a separate roller which revolves in accurate register upon the paper as it passes around the drum. On the rollers the designs are worked out in patterns of brass and felt. The colours are skilfully dove-tailed, and in passing once through the machine all the colours of the most elaborate

designs are applied and the paper comes out ready for delivery. Before the paper reaches the printing machine it must first be "grounded." As it is wound off the roll it goes through a series of brushes which apply the background upon which the figures are to be printed. In the making of some styles of borders this is an interesting process. A device for oscillating the brushes applies colours of all blends, from deep red to a light shade of buff, or from green to any other combination which the artist thinks will make a good contrast with the emerald hues. When the "ground" has been coated on, the top surface of the paper is wet. The colours do not dry as quickly as printers' ink, and in order to facilitate the work artificial means are resorted to. The paper is gathered in festoons and carried automatically for more than two hundred and fifty feet through the length of the entire building over a gridiron of steam pipes. The heat from the pipes dries the paper rapidly as it is carried along, and on the return trip a cloth web on the carrier racks guides the "grounded" material back to the main printing machine. After printing, the paper is again gathered into festoons and carried over a second tier of steam drying racks. It does not go back toward the machine this time, but is reeled into large bundles to be wound off into double roll lengths by spindles which wind the rolls for commercial use. The rolls are next taken and tied in bundles of twenty-five each.

Wrinkling of Paper on Machine.—The cause of sheet-wrinkling is a lack of uniformity in the flatness of the paper and of the impression surface. The two must coincide with a close approach to accuracy, or wrinkling and slurring will result. Difficulty in this respect is usually met with on the cylinder machine, for here we have a large flat sheet which has to be accommodated to a cylindrical surface, and made to fit its curve accurately, and this means that both paper and cylinder must be of true form. Paper, as delivered, is cut and packed flat, and is then in proper condition for feeding to a cylinder machine. But if it is unduly exposed to moisture it swells in places and loses its flatness, perhaps only a trifle, but sometimes enough to prove a trouble in printing. In such a case there is no

remedy except to have the paper sent to be pressed and dried, or cut up for use in small work where its lack of flatness will not cause any serious trouble. If the packing of the cylinder be uneven, as by building up the impression at certain points, so that the surface is no longer that of a true cylinder, a tendency to wrinkling must result, and it can be got rid of only by removing the elevations on the cylinder. Every overlay, and sheet containing overlays, requires to be drawn and pasted down tight and flat so that the final surface of the tympan shall be smooth and tight. Improper setting of the front guides or of the grippers will also cause wrinkling by bringing the sheet on to the cylinder with puckers in it. The sheet may be flat and the cylinder surface true; but if the paper be not evenly seized by the grippers it will not lie flat on the cylinder and wrinkling must follow. When a wrinkle appears in a job the proper way to locate and get rid of it is just to examine the paper and see if it is flat; then to let the cylinder take a sheet and carry it a few inches from the feed board, and to make a thorough inspection to see whether the sheet has been thoroughly gripped. If nothing wrong is found it is certain that the trouble is with the cylinder packing, and it should be looked for at that point where the wrinkle begins.

A Tool Chest for the Machine-minder.—In most trades demanding the use of special tools the workman should take a pride in the selection of tools. But often the best-equipped collection of tools does not extend beyond a mallet and planer, a large and small tommy-key, a paste-pot, a make-ready knife, a pallet knife, and possibly a spanner and a pair of scissors. In any one of the various contingencies that daily arise requiring any further tools, they have to be borrowed from some other department. If a stereo-plate blacks, the stereotyper is summoned to remedy the matter with chisel or punch, not because the minder is incompetent to do it, but because he has no tools to do it with. The time that is wasted through want of tools is incalculable. It is an evil that does not come so directly under the observation of employers as some others, and thus prevails unchecked. A practical machine-man

has submitted what from his experience should constitute the tool-chest of every machine-minder. It is as follows: Two chisels, two screw-drivers, two bodkins, two pallet knives, roller knife, two cutting-out knives, small paste-pot, small glue-pot, one or more spanners, two tommy-keys, engraving tools, planer, mallet and shooter, small plane, flat file, three-quarter file, pair of scissors, small oil-can, box of French chalk, pair of pincers, screws, pins, and tacks.

Gluing Machine Belting.—Belting for machines is generally sewn together in printing offices. Abroad, the gluing of the belts has been found to answer. The double belts are split up a few inches, say about three, at both ends, the upper part of the one, and the under part of the other cut away, and both overlying parts glued together, which can be done easily in a few minutes. When the belt is drawn through the machine, the two ends of the belt are seized, the belt is brought to the required degree of tension and then glued. Single thin belts for steam-presses can also be glued instead of sewn.

To Test Leather Belting.—A simple method of determining the value of leather belting consists in placing a cutting of the material about 0·3 of an inch in thickness in strong vinegar. If the leather has been thoroughly acted upon by the tannin, and is hence of good quality, it will remain, even for months, immersed without alteration, simply becoming a little darker in colour. But, on the contrary, if not well impregnated by the tannin, the fibres will quickly swell, and, after a short period, the leather becomes transformed into a gelatinous mass.

Clean Belting.—Probably no part of the equipment of a printing office using power of any kind is more neglected than the belts. Only when they become loose or pull apart do they receive attention, and then they are simply tightened and re-laced. Belts accumulate dust and dirt, which absorb the moisture, and eventually become hard and dry, causing them to crack and slip. If the face of the pulley becomes bright and smooth, it shows that the belt is slipping. A belt can be cleaned by means of warm water applied with a stiff brush, or by holding a square-edged

board against the belt while it is in slow motion. Belts should be cleaned regularly, and after cleaning, a good belt dressing should be applied. A proper dressing will keep the belt soft and elastic, and will cause it to hug the pulley and transmit its greatest power. The use of a good belt dressing is superior in economy to any other method for correcting a slipping or slightly loose belt. The custom of tightening a belt every time it slips is not a good one. The belt is liable to be made too tight, which heats the bearings and strains the belt. An easy working strain for a single belt is about fifty pounds for every inch of breadth, and for a double belt eighty pounds.

Cotton Belting.—When new, these require taking up or shortening once or twice more than leather. The stretch is approximately six per cent. as against four per cent. in leather, but once well at work they give less trouble, as there is but one joint to look after. If put on tight enough, this stretching is diminished to a great extent. Users are afraid to overstrain the belt, but experiments made as to tensile strain show the impossibility of breaking a belt under fair conditions.

Preservative for Belting.—New belts should have enough dressing in them to last several months, unless they are getting very hard treatment. Castor oil is a good preservative dressing.

Cleaning Rubber Blankets.—The use of turpentine in removing grease and colour from rubber blankets is increasing to such an extent that a few suggestions as to its use and effect may be given here. The quantity used should be as small as possible, and great care taken that it is thoroughly dried out before the blanket is used in printing. Otherwise, as turpentine softens the rubber face, the blanket will be injured by the pressure of the cylinder causing wrinkles to appear upon the face. It is preferable to clean the blanket after work at night, thereby giving ample time for the turpentine to dry out, rather than in the day-time when the press is in use. The use of ammonia, as a substitute for turpentine, is strongly recommended, with less chance of damage to the blanket.

Cleaning Machinery.—Take half an ounce of camphor, dissolve in one pound of melted lard; take off the scum and mix in as much fine blacklead as will give it an iron colour. Clean the machinery and smear with this mixture. After twenty-four hours rub clean with a soft linen cloth. It will keep clean for months under ordinary circumstances.

Lubrication of Printing Machines.—All machinery should be kept clean, and well oiled every morning; but newspaper and fast speed machines should be oiled twice a day. It is very important that printers should have an oil for their machinery which is quite free from any tendency to glutinating or clogging qualities. Very often great inconvenience and damage are occasioned by using inferior lubricants.

Lubrication of Gearing.—It is a too prevalent idea that waste lubricants are good enough for gear teeth. This idea doubtless arises, where it exists, from the conception that gearing must wear by frictional contact, and that its life depends solely upon how well constructed it is for its particular work. The lubrication of gearing is entirely different from that of journal bearings. In gear teeth the lubricant that will best serve the purpose for which it is intended must possess tenacious qualities to adhere and build a deposit on the working surfaces of the teeth, thus preventing metallic contact and subsequent wear and noise, and with a like deposit on the opposite sides of teeth, reduce side clearance and form a cushion for back lash.

Safeguard against Warping of Cuts.—It is recommended, in printing from original woodcuts, to place a sheet of gutta-percha under the forme. This prevents warping.

The Silvering Solution for Cuts to be worked with red ink is prepared as follows: Nitrate of silver, 2 drams; water, 27 drams; sal-ammoniac, 1 dram; precipitated chalk, 4 drams; to be thoroughly shaken before using, and applied with a soft brush or cloth so as to cover the printing surface.

Protecting Coat for Process Blocks.—This recipe is a good one, and consists of the following ingredients: 2 lb. tallow, 3 lb. asphalt, 1 quart of turps. Boil until well dissolved, then add 2 quarts of warm turps before using. It is essential that the blocks, before they are covered with the mixture, should be cleaned of all ink and carefully dried. It should also be noted that this composition is a somewhat inflammable one.

Suggestion for Cleaning Half-tone Blocks.—A common difficulty with such blocks is the cleaning of them; washed ever so carefully and repeatedly, very often the dots retain some amount of dirt which seems immovable and make a muddy or blurred printing. A hard india-rubber will sometimes clear out the dirt if applied vigorously.

Preserving Zinc Blocks against Rust.—A single drop of water left on them by inadvertence will oxidize these plates. Mutton fat is a means of preventing oxidation and the damaging influence of humidity. Before using this preservative, the plate must be rubbed perfectly dry with a smooth and clean linen rag; then the fat is lightly rubbed over the surface. When the block is to be used again, the grease may be washed off with spirits of turpentine.

Another Way to Preserve Process Blocks.—When washing the forme, be sure that no potash, lye, or soda is left on the blocks, but clean with a pure bristle brush and benzoline, or turpentine, and dry by gently dabbing and not rubbing with a linen rag free from lint, and finish off by rubbing with the palm of the hand. When dry, rub over with Russian tallow, mutton fat, vaseline, or solid paraffin, or brush over with melted beeswax. Put away in a dry place without wrapping up in paper—paper sometimes contains chemical matter which, when brought into contact with zinc, causes it to corrode.

How to Preserve Zincos and Electrotypes.—No doubt many printers are being continually annoyed by finding that their zinco plates, after being laid by for a time, are completely spoiled by the damp. So sensitive

are the plates to moisture, that a single drop left on them by inadvertence will completely spoil them. A very effective though simple way to preserve them for an indefinite time is to wipe them thoroughly dry with a clean cloth, and lightly smear them with mutton fat; they may then be stored away for any length of time without fear. The fat can be easily removed by brushing the plate over with turpentine. Electrotypes may be effectually preserved from the attacks of their insidious foe—verdigris—by treating them in the same manner.

The Cleaning of Wood Blocks.—The proper cleaning of wood blocks is a matter of great importance. Nothing is better than the essence of petroleum for this purpose. The petroleum volatilizing rapidly, does not gum up or injure the blocks, but renders the face of the wood smooth, and consequently increases the fineness of the work produced. The cost of the petroleum is less than half that of turpentine, and the rapidity with which it dries allows the blocks to be washed without removing them from the press or machine.

Speeds of Shafting and Pulleys.—Calculate the revolutions per minute of driven shafting or pulley, multiply in inches the diameter of the pulley on the driving shaft by the number of revolutions per minute that pulley makes and divide by the diameter (in inches) of the driven pulley; the result will be the answer required. For instance, the engine makes 80 revolutions a minute and the pulley on it is 15 inches in diameter; the diameter of the driven pulley is $13\frac{1}{2}$ inches; how many revolutions a minute will the last pulley make? *Answer*: $80 \times 15 \div 13\frac{1}{2} = 89$ nearly. To count the revolutions of a pulley or shaft not moving very fast, chalk a mark on it and count how many times it appears (in a minute, or to an impression, as may be).

Stability in Driving Power.—A printer of repute says that registered work, if done with accuracy on a large sheet—say 22×28—on a steam-press, could be expected only from a press that is isolated and not run by the same engine that is driving other presses. His statement is, that where a register is sought that is accurate to a hair-line,

the press must run at an even speed, and that if other presses are running and being continually thrown on and off, the jar, as imparted by the alternating diminished and accelerated speed of the engine, is sufficient to affect the register. This may strike many as a refinement of care, but it illustrates the difficulty and impossibility of doing good work unless every attention is given to detail.

THE PRINTING OF WATCH DIALS.—The best dial plates are printed by means of copperplate transfers, which are laid on the plates while slightly damp, and after the application of a firm pressure are allowed to dry. The paper is then soaked and crumbled off in the usual manner. A vitreous powder is dusted over the transfer thus made and becomes thoroughly incorporated with the ink. The subsequent enamelling and firing produces a flint-like impenetrable gloss which is both brilliant and lasting. The process is no doubt considerably modified for cheaper productions. The transferring may be somewhat similar to that already described, but the glaze is only a heavy coating of copal coach-body varnish.

A RUBBER LUBRICATOR FOR BELTS.—Five parts of india-rubber are cut fine and melted together with five parts oil of turpentine, in a well-covered iron vessel, to which are added four parts of resin. This is stirred thoroughly and melted, and four parts of melted wax mixed with the same, the mass being constantly stirred while melting. This composition in its warm state is added, with constant stirring, to a melted mixture of some fifteen parts of fish oil and five parts of tallow, and the whole agitated until it has congealed. The compound is applied to old belts upon both sides in a warm place, and, when the belts are in use, from time to time upon the inner side.

POWER OF BELTING.—A belt travelling 800 feet per minute will safely transmit one horse-power for each inch in width if the pulleys are both of the same diameter, and the belt laps over one half of each; but if the belt laps on but one quarter of either pulley's circumference, then it would have to travel 1,230 feet per minute to transmit a horse-power for each inch in width.

Horse-Power.—Eight man-power is equivalent to one horse-power, and this last is arrived at by the power or force which a horse generally exerts. It is compounded of his weight and muscular strength, and decreases with his speed. It is generally reckoned, in mechanical calculations, equal to 33,000 lb. raised one foot high per minute; and if continued throughout the day of 8 hours, amounts to 150 lb. conveyed a distance of 20 miles, at a speed of $2\frac{1}{2}$ miles per hour.

ROLLERS

POINTS ON ROLLERS.—When ordering rollers state the general atmospheric condition of the machine-room, and the maker will send rollers to suit this condition. These rollers should arrive well covered (including the ends) with grease to protect them from the air. After receipt they should be allowed to season (covered with grease or soft, slow-drying ink) at least one week and not used for the first time on a day when humidity prevails. The action of the air on rollers is harmful, just as it is to fabrics or provisions; therefore the less the rollers are left uncovered the better they are preserved. They should never be clean except for a minute or two at wash-up. There are many good washes in use: gasolene, benzine, naphtha, kerosene, lubricating oil, tarcolin, etc. Lye is sometimes used in cases where ink is dry and hard on rollers. This is a sure way to ruin rollers unless the dilution is very great, and then the water does the rollers little good. Dead oil is the best wash to use for difficult cases, where lye seems necessary. It is equally efficacious and does not harm the face of the roller as does lye. Dead oil, much used by lithographers, can be had of large gas plants anywhere. It is better never to allow inks, especially quick driers, to dry on the rollers. Of course, any washing should be clean, even to the last minute speck. If they are not, little specks will adhere to the rollers, impairing their functions and making subsequent satisfactory "wash-ups" difficult. Successful colour printing is largely a matter of thorough wash-up. Where the rollers have been very carefully washed the second time, to make assurance doubly sure, lay a sheet of white news, as wide as the rollers are long, on the disk and run the rollers over it several times. Any remaining dirt will adhere to the paper.

Good *v.* Bad Rollers.—On the necessity of good rollers for good printing a book might be written. Be the type ever so new and bright, the machinery of the best and most approved patents, and the ink up to the mark, without a good roller all the labour and industry will be greatly marred. The roller, black as it is, dull as it is, unpleasant to handle as it may be, is the secret that, once learned, makes it an easy task for a printer—with proper care in other directions, of course—to print well. On the maker depends the quality of the roller, and on the printer lies the duty of keeping it in order.

Roller Composition.—Little is known in most printing offices as to the ingredients of the various kinds of composition rollers. One of the principal things in a composition is its non-liability to be affected by change of temperature; for this purpose the use of glycerine is very valuable, as it is little affected by heat, cold, or frost, while retaining moisture much better than the old treacle and glue compositions. The addition of glycerine, however, necessitates different treatment in regard to cleansing. Water should not be used on a roller containing glycerine or gelatine. The tendency of heat on rollers is to soften them, and cold to harden them; therefore for cold weather the ingredient which gives softness to rollers should be in larger proportion than for hot weather. If the ordinary recipe were treacle eight parts and glue four parts, for cold weather it would be best to give three parts of glue and nine of treacle. These proportions would depend very largely, however, on the quality of the glue, experience teaching that this greatly varies. Another good recipe for cold weather is glue ten parts, sugar ten parts, and glycerine twelve parts. The glycerine will offer strong resistance to frost and cold.

Facts about Rollers.—The setting of a roller, especially on a cylinder press, requires care and judgement. Rollers cast from re-casting composition never shrink. Roller trucks should be one-sixteenth of an inch less in diameter than the roller. Glue and molasses rollers should be kept in an air-tight box with a shallow jar at the bottom

for water as needed. In damp weather remove the water, in dry weather let the water remain. Rollers when out of use any length of time should be put away with the ink on them to protect their surface from the action of the atmosphere. It would be difficult to find a pressman who could be induced to believe there was anything for him to learn in the making of rollers. Several things enter into the choice of composition, such as quality of ink used, climate, class of work, requirements of presses, etc. The cores should be cleansed by scraping, or, if of wood, by scalding in strong lye or soapsuds, then dried. New rollers should be washed in sperm or coal oil before being used. It will prevent the strong suction. Turpentine is better than benzine for removing coloured inks. Never use lye on new rollers.

Best Period for Making Rollers.—The months of April and May are the best to get rollers for summer use. Do not wait until the hot weather is come. It cannot be expected that winter-made rollers will work well in hot or muggy weather.

To Keep Rollers.—In Germany the following preservative of rollers when not in use is often applied: Corrosive sublimate, 1 dram; fine table salt, 2 oz.; put together in half a gallon of soft water. It is allowed to stand twenty-four hours, and is to be well shaken before using. Sponge the rollers with the mixture after washing.

The Care of Rollers.—Rollers may be kept with a fair working surface if put away with very oily ink upon them. If they are put away with ink which has much varnish or driers in it, short work is made of the rollers, for they then harden and crack along the face, and the ink cakes upon them. The "hardening effect of the atmosphere" is as nothing to the contracting and splitting effect of driers which are allowed to cake on the roller. Even the too frequent use of benzine, strange as it may seem, has the effect of gradually shrinking a roller. Lye is destructive to the face of the rollers when used by inexperienced or careless persons. It is injurious in the best of hands when frequently used. Put the rollers away well coated with

thick oil, which is free from acid or alkali, oiling the ends even more carefully than the face, and you will have no trouble. The whole theory of roller treatment, however, is the prevention of the escape of the moisture necessary to retain elasticity, tackiness, and the other qualities which go to make a perfect inking implement. A sponge-pan in the roller-box is the most valuable aid to the longevity and working power of a roller. As to putting away inky rollers, be wary of so doing, unless you are familiar with the quality of the ink that is being used. If this is of the quick-drying job variety, washing off after using is strongly advised; and see that the rollers take their moisture through the pores, from the humid atmosphere of the roller-box or closet, before they are used again.

Remedies for Damp and Dry Rollers.—Sometimes pressmen find fault with their rollers, and there may be reason for grumbling. If a remedy is wanted on the spot, one or two suggestions may prove useful. If a roller is affected by moisture in the atmosphere, wash it with common alcohol, which evaporates the moisture very quickly. If the roller is too dry, take 100 parts of glycerine, 10 parts of ammonia liquor, 40 parts of old beer, which has turned sour; mix it well together, and wash the rollers for five to ten minutes, or even longer. The ammonia re-opens the pores of the surface for the glycerine; the beer, by drying up, creates a compound which adheres strongly to the surface of the roller.

Damp or Greasy Rollers.—These may be known by their printing a dull, dirty gray instead of a proper black. If new, wash them in turpentine; if old, in lye. A far better plan is to smother them in common ink-scrape, and sheet them; this is always effectual with greasy rollers. If a damp roller does not recover with this treatment, hang it up in a warm room until it does.

Rollers in Damp Weather.—Long-continued wet weather has caused endless trouble with rollers designed for summer use, once again demonstrating the advantage of retaining sets of seasoned rollers. Kelly's "Presswork" mentions the use of powdered alum to enable patent com-

position rollers (glycerine and glue composition) to distribute ink and cover the formes with any degree of satisfaction during humid and damp weather. Concerning this a correspondent stated that he and others had much trouble from wet and humidity, and tried all sorts of experiments. New rollers acted as badly as those which were seasoned. They changed the inks, warmed the press disks, etc.; finally their efforts were crowned with success by the use of powdered alum. When the rollers ceased to do their duty satisfactorily, they were washed with benzine and the face of the rollers covered with powdered alum, allowing them to stand for about half an hour, then wiping them off with a dry rag, and then the work went on right for that day at least.

Cooling Rollers.—It may be well to warn the printer against putting a roller into a refrigerator, or it will soon become frostbitten and utterly useless. It may be thought that when the roller is almost separating from the stock in hot weather almost any mode of cooling it would be desirable. The sudden chill to the surface is, however, quite enough to spoil the roller before the cold has time to penetrate sufficiently deep to harden it. If unworkable, owing to the excessive heat of the atmosphere, hang the roller all night in a cool, dry cellar, or in any cool place where a good current of air can get to it. If it is a small roller, swing it well to and fro for a quarter of an hour before using it.

To Dry or Warm a Roller at Short Notice.—Hold it a few feet from a moderate fire and keep turning the roller on its axle for five minutes. Or, take some sheets of waste paper and make them hot, wrapping the roller in them, one after the other. If a new roller be required from the maker, always send a blanket to wrap it in. If to be sent by train, rollers should be suspended in a box.

Another Method of Warming Rollers.—If rollers have become too cold, place them in warm rooms, not near the fire, until they recover themselves. When they begin to work, place a candle or gas jet under the ink table—if an iron one, the flame about a foot below the iron—and

occasionally vary the position of the flame. The table must not be made hot, and the heat applied must be imperceptibly small, as the object is only to remove dampness and the rigidity of the cold.

Flaring a Roller.—This operation is dangerous to the roller and to the workroom, but nevertheless particulars of how it is done are here given, because it is a favourite device with some London pressmen, especially in small offices. It is as follows: Get a sheet or two of waste printing paper, make it up into a loose torch, and when lighted flare the roller all over, just sufficient to add a new face to it without melting the composition. This plan will, if successfully executed, close up the fissures caused by the cutting of brass rule.

Recipe for Softening Rollers, etc.—The following formula will be found invaluable in the press room:

Boiled linseed oil	2½ oz.
Balsam fir	1½ oz.
Damar varnish	2 oz.
Balsam copaiba	3 oz.
Simple syrup	2½ drams.
Mucilage (gum arabic)	2 drams.
Pulverized alum	½ dram.

Shake well and let stand for several hours before using. A little of it softens up sticky rollers or ink, reduces ink without affecting its colour, makes cold-weather printing possible, is just the thing to mix various colours with in making tints, and is in every respect more useful than the ordinary printers' varnish. This formula will make about a quart.

Renovating Old Rollers.—When rollers have been lying for weeks with a coating of ink dried on to the surface —a circumstance which often occurs, more especially when coloured inks have been used—get an ordinary red paving brick (an old one with the edges worn away will be the best), place the roller on a board, then dip the brick in a trough of cold water and work it gently to and fro on the surface from end to end, taking care to apply plenty of

water, dipping the brick in repeatedly; and in a short time the ink will disappear. Nor is this all; for if a little care and patience are exercised, it will put a new face to the roller, making it almost equal to new; the coating of ink having, by keeping the air from the surface, tended to preserve the roller from perishing. Sponge off clean.

Too New Rollers.—Coat the roller by distribution with balsam copaiba and let it hang for two hours; after which, scrape it. This ill-smelling drug is also very useful if mixed with black or coloured inks when they do not work satisfactorily.

To Revive Rollers.—Rollers having lost their suction will acquire it again after being washed with water in which some honey and a small quantity of gum arabic has previously been dissolved; but before such washing they must be perfectly clean. After washing, they are to be left drying for some hours, and this refreshing will therefore be done best at closing time in the evening.

Method of Renewing Printers' Rollers.—A simple way of renewing old, worn-out rollers is the following: The rollers are first cleaned with acetic acid, then revolved in a solution of gelatine and glycerine, which fills up the holes and forms a thin coat on the top of the rollers. This dries while they are revolving, and makes the rollers equal to new.

Good Wearing Rollers.—It is stated that rollers made from Chinese sugar-cane molasses are far superior to those made from any other kind. The syrup will bear long boiling without granulation, and when cast into a roller is much tougher, more elastic, and has better suction than those made by the material in common use.

Wear and Tear of Machine Rollers.—There may be more than one reason why distributors wear at the ends: are the stocks clean and free from grease? A good plan to help composition to stick well to the stock is to tie round the latter some tape or band previous to casting. Perhaps the rollers are not sufficiently supported in their

runners; distributors should be so fixed that they barely touch the inking-table, and should not be allowed to be so low in the runners as to cause them to bump against the ink-table every time it returns. If too low, the runners should be packed, so as to lift the rollers barely to leave their own weight on the ink-table. A good way to prevent rollers pulling is to cut off the end of the composition slopingly, and hold the end of the roller in a gas flame: this will slightly melt the composition, which may be drawn well over the stock with the finger, effectually making the end air- and water-tight. If the composition at the end of the roller is not fast to the stock when washed, water gets under, with the consequence that the composition swells, making the roller thicker at the end than in the centre.

Cracked or Cut Rollers.—These are almost incapable of being mended. If they are cut by working rule formes, they may be hung for a day or two to recover themselves. If split or cracked by accident, let the flame of a lighted candle into the fissure and close carefully with the fingers; then let the roller be hung up to recover. The fingers must be wetted, to prevent the composition sticking to them. Take care never to use a cut roller for colour-work, as the old black ink will be sure to ooze out of some of the apertures. When working at press always cut round those parts of the roller-handles which rest upon the ink-table before commencing colour-work, or the black ink which adheres to them will deteriorate the colour.

The Life of Rollers.—The machine-minder has also much to do with the longevity of rollers, for good washing is an important condition of length of service. Well looked after, rollers can be made to last from one spring to another, but with careless treatment they will scarcely last a month. Every roller-maker or machine-minder knows that new rollers require to be left a certain time before they are ready for use. Prematurely called into requisition, they would be of little practical service. The experience of the workman, joined to the state of the temperature, will best serve to decide the time rollers should be left before use.

During cold and dry weather they may be used nearly as soon as cast; they will be sufficiently firm to avoid becoming soft later on. During a high temperature it will suffice to leave them exposed to the air for a night under shelter. With a warm, damp temperature, it is, on the contrary, preferable to cover them with ink, for the damp will no longer exercise any influence over them. Having reached complete maturity, rollers should be covered with ink every evening, and washed as little as possible. The value of rollers may be long preserved by carefully protecting them against the influence of the air. The most economical method for the printer with respect to rollers is always to have a sufficient number for use in turns.

The Treatment of Rollers.—Rollers are subject to so many ailments, that they must be well attended to, so as to keep them in order. There are times when they are affected by the heat, cold, damp, and dry, and must be treated accordingly. A good roller should be moderately soft and elastic, and not be too new. It depends upon the manufacture how old it should be before being fit to work: some rollers may be used a few hours after coming out of the mould, while others of a damper nature should not be used for a week. A new roller should have a moderately dry face before putting it on the machine, otherwise it will not take the ink properly, and will friar the type, and the composition is likely to draw off the stock. They should be washed with turps, and kept in a thoroughly dry place, slightly oiled. Old rollers should be well washed with lye and rinsed with water; they should be smothered over with thin broadside ink, but should occasionally be scraped and re-inked to prevent drying on. In hot weather rollers should be kept in a cool place.

Testing Rollers for Condition.—Rollers are expensive items in the machine-room, and are the cause of much bad temper. The proper use of a roller can only be taught by experience, and that different rollers require various modes of treatment is shown by the fact that even the best pressmen disagree as to the proper way of dealing with them. When new rollers arrive from the casting-room,

they should be trimmed carefully, and the ends should be soldered with a hot iron, and care taken that the composition does not leave the cores at the ends, as is frequently the case with home-made rollers. To determine when a roller is in the best working order, neither "green" nor "dry," is one of the tests of the capability of a printer. Pressing the palm of the hand lightly upon the face discovers a clinging, semi-adhesive feeling, learned only by men of experience; hence the skill necessary to detect it. Passing the front of the fingers' ends quickly and lightly along the roller, there is found a certain smoothness in connection with the clinging feeling which is peculiar to a good roller only. To determine when a roller is properly seasoned and fit for work, run the fingers lengthwise over the surface, and if smooth and it has a gentle rebound, it may be considered ready and fit for use; but when it feels sticky and shows the marks of the fingers plainly upon the surface, it is unfit for use, as there is not surface enough formed upon its face to render it tough and durable. The edge round the end should be tough and not easily nipped off with the finger-nail.

Preserving Rollers.—A process for preserving and renovating ink rollers, and adding greatly to their longevity, is as follows: A steam jacket is added to the roller closet, and numerous fine jets are so arranged as to play gently upon the rollers within. These jets thoroughly cleanse the surface of the roller, the skin on its face disappears, the body of the roller absorbs a portion of the heated vapour, and the whole is kept in a fresh, elastic condition, ready for work without further preparation. Experiments made by practical men seem to show that the contrivance possesses value, and is likely to prove economical in large printing establishments.

The Use and Preservation of Rollers.—The vibrator must touch with equal lightness both the ink cylinder and the inking table. It cannot be set too finely, and especially where there are top and bottom vibrators. Time the vibrator so that the table is well out before they meet, thus avoiding the blow, resulting in fretting, which the

vibrator would otherwise receive from the table. When the ink is not out the full width of the duct the ends of the vibrators should be supplied with a little thin ink, or a little tallow be put in the ends of the duct, which will assist all the rollers. Working a vibrator dry at the ends, or allowing it to be worked in contact with the ink half dry, is encouraging fretting and picking. The wavers ordinarily work at an angle, but in some of the latest machines they work horizontally with geared riders, and here the utmost care must be taken that the contact with table and riders be as light as possible. Where wavers are set at an angle, either with movable or rigid forks, be very careful that the angle is as slight as possible, just sufficient to allow the roller to move from shoulder to fork. If the angle is too great the table drives the roller and causes it to fret and leave the stock, and the distribution is not so good. To set wavers, lay them across the slab and raise the forks, either by screw or washers, until they take a little of the weight of the roller. The table must not actually lift the waver. Wavers should be well seasoned before going into the forks; and, as with the vibrator, when the ink is not fully out the ends should have some lubricant. A touch of ink in the forks will assist in checking the spinning of the waver previous to the return of the table, and so lessen the reverse movement. Observing these directions will save all trouble with wavers. With regard to the inker, a bent spindle or a lop-sided roller causes monks and friars in the work and injury to the roller. If the wheels are not tight on the spindle, or if the bearers are greasy, the inker, instead of being carried round by the bearer, is pushed and dragged round alternately by forme and table. Where machines have geared riders on the inkers, such riders require very careful adjusting, and no force should be used in the setting of the rider, as undue pressure will spoil the rollers and the work. In setting the inkers for a rotary or machine with geared riders, the adjustment of such inkers by slips of paper about two feet apart is recommended, which must not be gripped so tightly but that moderate force will pull them away. Care must be taken that the spindles of all the rollers on rotary machines run free, as any heating of the iron spindles may

affect the composition. In all cases the rollers should be set to touch the table very lightly. On a very deep forme one of the inkers may be turned on the forme itself, and this should be watched. If a short forme is being worked, the outlying portion of the inkers must have a lubricant, as suggested for the wavers and vibrators.

PRESERVING "DURABLE" ROLLERS.—Before using new rollers, or rollers which have been cleaned up, the instructions are to sheet them in waste set-off sheets. Do this also if rollers should have become "green." When the rollers are in daily use they do not require cleansing for several days, as ordinary book ink will not readily dry on them. Ink should on no account be allowed to dry on them, and may be prevented from drying by lightly smearing with machine oil. These rollers must not be sponged or washed with water. When they require cleaning, or when changing colour, or if they are intended to be laid by, clean them with a little paraffin, petroleum, or turpentine, and wipe off quickly with rags free from lint. When cleansed they should be kept in a warm and dry place, so that they will be quite ready for use without any time being lost in giving them suction. Attention should also be given to the inking table, which should be thoroughly cleansed and dried before starting. Chamfer the ends of all rollers to prevent ink, oil, or grease getting between the composition and the stock and causing them to part. Following these directions will save the time lost and annoyance caused by the old process of washing and inking. The rollers need only be lifted at meal-times and night from forme and slab, and are ready for starting.

CASTING ROLLERS OF "DURABLE" COMPOSITION.—The directions are that the melting kettle must be quite clean and either hot water or steam jacketed. The mould must be quite clean, warmed, and slightly oiled inside by means of a swab sprinkled with common olive (gallipoli) oil. The stocks are to be well cleansed and painted with common lead paint, and allowed to dry. If iron stocks, warm just before casting the roller. Under certain conditions, stringing the ends of stocks may be desirable. Cut the composi-

tion into strips (not blocks), and feed into the kettle gradually, stirring gently sufficiently to prevent burning of the sides of the kettle. If the composition should be continuously or violently stirred a ropy mass will result, out of which a good roller cannot be made. When the composition is thoroughly melted (avoid over-cooking), pour it in a gentle, steady stream on the end of the stock. By pouring down centre of mould, air will have a better chance of escaping. If there should be a surplus in the kettle, draw it off into shallow pans.

Re-casting Rollers of "Durable" Composition.—To do this well the ink and dirt on an old Durable roller should be scrubbed off with hot lye. After this, cut the composition off in strips, and judge whether it is pliable enough to melt readily; if not, place it in cold water for about ten minutes, after which take it out, cover it up from the air, and let it lie all night. Prepare kettle, moulds, and stocks as in "Directions for Casting"; first put into the kettle strips of new composition, from a quarter to one-half the bulk of that intended to be re-melted, this being regulated by the conditions above stated, and when this new composition is perfectly melted add the old gradually, and proceed as in "Directions for Casting." Use a sieve ($\frac{1}{8}$-in. mesh) when drawing off re-melted composition, so as to catch the lumps which will not dissolve. Do not prolong the process of re-melting for the sake of a few [illegible] pieces. A re-cast roller, as above described, will in all essential respects be equal to the original casting. Aniline colours and other chemicals in modern printing inks are not favourable to the life of a roller, acting in some cases like tan upon a hide. A roller so affected generally resists all attempts at re-casting Rollers, also, that have been in work, perhaps, for years may have become perished with use and age and be worthless for re-casting.

Patent Roller Composition.—This refers to a special treatment for composition rollers, having the advantage, it is claimed, of keeping the ink clean and free from dross. Before the composition (which is of the same kind as com-

monly used) is applied to the stock, certain proportions of either one or more of the following chemicals in solution are mixed with it: Bichromate of potash, bichromate of ammonia, chrome alum, or tannin. The stock is coated, and then exposed to daylight, or strong artificial light, which exposure renders the composition insoluble. The composition is then ready to receive an oil varnish. It is further claimed that the rollers are rendered very smooth, and will ink much quicker than ordinary rollers, and that machines can be run at greater speeds.

Apparatus for Roller Casting.—A recent American invention is an apparatus for casting printers' rollers, where many rollers are required, by which the operation is facilitated and provision made for injecting the composition into the moulds from the bottom instead of pouring it in at the top, so as thoroughly to expel the air. The usual perpendicular cylinder and mould tubes are provided, but the cylinder is made to revolve on an axis, over the base plate. Perforations in the bottom of the cylinder correspond with the mould tubes in a line from the centre. A gutter extends from the centre of the plate to its edge, terminating in a connection with the reservoir of melted composition. The cylinder is turned till the gutter is under the perforations, above which are the moulds. The composition is forced through the gutter and upward into the mould tubes till they are full. Then the cylinder is turned till an empty row of tubes is brought over the gutter, and the process is repeated. The base plate prevents the escape of the composition from the moulds till it cools and hardens.

To Cast Rollers.—See that the roller-mould is perfectly clean; make a mop and with it oil carefully every part of the interior of the mould. Now turn your attention to the stock; be quite sure that it is perfectly dry, and if the composition is apt to slip off it, bind some string very lightly upon it, then place it in the mould, being very careful that it stands true in the middle; fit on the guide at the top, and fasten the stock down to the mould with string lest it should rise; then warm the mould all over.

Meanwhile your composition will have been melting: take care that it does not boil, and stir it about occasionally. Never re-melt old composition without a good proportion of new, and if the old is very hard, you may add some treacle. It is best to use one of the special kettles sold by the printers' furnishers, as otherwise there may be some difficulty in getting the composition to melt properly. When it is quite melted, carefully pour it into the mould, filling it to the level of an inch or two higher than the end of the stock to allow for shrinkage. Let it stand for about twelve hours; then prepare to draw the roller out of the mould. If it will not come readily, one man must hold the stock and another the mould, and they must pull without jerking in opposite directions. Pushing upon the lower end of the roller may perhaps be necessary also, but if the mould has been properly oiled there ought not to be much difficulty in drawing it. When out, trim the ends, and hang it up in a dry, cool place for a day or two before using.

Another Recipe for Casting Rollers.—Cut the composition into small pieces to facilitate melting. If too firm, add when melted a sufficient quantity of either glycerine or molasses. Water must not be added, as the composition will shrink on the rollers after casting if this is done. Have the mould well warmed before filling, which is best done by plunging the mould into hot water for a few seconds. This prevents the composition getting chilled ere it reaches the bottom. Carefully oil the inside of the mould. When renewing rollers, sponge the face of the roller with warm water; scrape off the face thoroughly with a knife previous to removing the composition from the stock, and cut it up small. If the roller has been used only a short time it may be melted as readily as new composition. If too firm, add glycerine or molasses, as mentioned above. It sometimes happens that small pieces refuse to melt readily along with the bulk of the composition. Such pieces always float on the top. On no account melt these pieces, but remove any such at once from the pot, and cast your roller, as by continuing the heat there is great danger of overboiling the whole, when the composition becomes

leathery and ceases to be a liquid. In re-melting, a certain percentage of refractory pieces is sure to occur, and must be sacrificed. Wash the stocks after removing the old composition, to remove all traces of grease. On no account allow the composition to remain in the pot after it is melted, but pour immediately into moulds. Every minute that the melted composition remains it is deteriorating. Crystallization is caused by boiling, and the composition becomes stiff and stringy.

Lithographic Rollers.—A roller which is not to be used for three days should be left in medium varnish. A roller not to be used for eight days should be covered with tallow. A roller not to be used for months should be rolled up in glycerine. Provers should keep at least six rollers—one for black, one for red, one for yellow, one for blue, one for tint, and one good roller with sharp grain for crayon drawings. The blue roller can be used for green and purple also; this will not last long, because blue, green, and purple inks eat into the roller, and the frequent washings necessary will cause it to wear out soon. Scrape the roller alternately with and against the grain—that is, first in one direction and then in the opposite. A soft roller fills up the work; one too hard takes the work off the stone. A roller too smooth slips over the stone, and takes the work off also. A roller with fine grain makes a solid impression. A roller with a rough grain makes a sharp impression, but not a solid one. An uneven roller should not be used at all. A bad roller is a detriment to every printer using it, for the best of them can do nothing with it. The best roller, even if costing double in price, is cheapest.

Hints for Washing and Setting Rollers.—These directions for cleaning and setting rollers are furnished by an American roller firm. These include the following: Rollers should never be washed with lye or any type-wash. These act directly on the roller and injure it. What is wanted is something which will dissolve the ink and at the same time have no effect on the roller. Any oil fulfils this condition. Kerosene is the cheapest, and answers the requirements. It dissolves the ink and has no effect on the roller. Other

oils will do as well, but none is so good or cheap as kerosene. Some say that kerosene, because of its penetrating qualities, causes fine longitudinal cracks in the roller, which fill with ink, and ruin the life of a roller. This cracking of rollers means a badly-compounded composition. Kerosene or other oils do not affect rollers. On wet, humid days it has been suggested to roll them in powdered alum. Alum will eat the whole face right off the roller and leave it rough, dead, and full of holes. But bad, damp rollers may be rolled in powdered carbonate of magnesia, or in any dry dust or harmless powder, to dry the face. If a roller is made right it will need nothing of the sort. Then, as regards setting rollers, set them evenly and very lightly. Shut out daylight between the roller and the ink table. Do not run a good forme roller flat. If the forme rollers have riders, set the riders lightly in the same way. Good forme rollers print better set as directed, and do not heat from the rolling compression. The duty of a forme roller is different from that of a distributor. It does not need to press hard. If the roller is good, it inks with a mere touch. No pressure increases the inking on the face of the type. If rollers are poor, old, and shrunken, that is another matter, then they have to be set hard to make them touch.

Pneumatic Rollers.—A method has been patented for making printers' rollers on the principle of the pneumatic tyre. It is further mentioned that a feature of the invention is an extremely simple valve which automatically closes when the pumping ceases, and also a simple means of securing air-tight joints of the rubber cushion on the spindle. This is interesting, for the success of such rollers would open up a wide field of usefulness. We do not remember any previous application of this principle being made, at least anything beyond mere experiment, and doubtless the pneumatic roller brings with it its own little problems, some of which may be readily foreseen. Pneumatic rollers might possess the advantage of lightness, but that is not so obvious for cylinders as for platens.

Difficult Rollers.—If printers' thin varnish be added to the ink in small quantities it very frequently allows the

roller to work, although with a pale, grayish appearance. The ink we now suppose is good, and the roller unruly. This expedient should only be resorted to on emergencies, although it is a favourite wrinkle with some pressmen. If you have a very hard roller and wish to work a light job, such as a circular, spit four or five times on the ink-table and distribute with a small job roller, holding it as one would a mallet, and well hammer the table with it, distributing it at the same time; that is, each time the roller strikes the table draw it along the table to the edge. Five or ten minutes bestowed upon the roller in this manner will cause it to work off a short-numbered job quite satisfactorily.

Patent Felt Rollers.—These consist of a roller or cylinder of wood or metal, the same being covered with flannel, and over this prepared felt. The backing, where such is used, may be flannel or cloth, wound about the roller, the protecting layer being of oil-silk, oil-cloth, or waterproofed fabric. The felt layer is saturated with a mixture composed of substantially equal parts of refined beef tallow, copal-lac and varnish, these substances having been well mixed and stirred in an equal quantity of turpentine oil. The roller when dry is ground and smoothed. The roller is claimed to possess several advantages in transferring ink or colour to designs, type, etc., and in lithographic and zincographic printing. It is stated that the felt cylinder does not expand like leather, and is not altered by impregnation with colour.

The Tearing of Waver Rollers.—It is frequently the case, especially on fast machines, for wavers to tear away at the ends. It is not the fault of the composition, nor the temperature of the machine-room, although rollers are affected by the cold, heat, and damp, and must be treated accordingly. The cause of the wavers wearing away at the ends is that the ink-table does not leave or meet the whole length of the roller at the same time, but causes it to start revolving at the end. To prevent this, some screw a piece of wood on to the end of the ink-table about two inches wide in the centre, narrowing to the ends to the width of

a quarter of an inch. This causes the wavers to start revolving from the centre, instead of at the ends, and preserves them. Some minders oil the ends of the ink-table, but this is not advisable when a large forme is on the machine. Another method is to cut away the composition, tapering within a few inches of the ends, but if the inking-table were made about two inches wider in the centre than at the ends, it would greatly preserve the wavers.

Lubricating Roller Moulds.—Sperm and lard oils are the best. If they are properly used, no trouble will be experienced in drawing the rollers.

Arched Rollers.—The arching of rollers is generally caused by their becoming dried or hard. When this takes place, and the outside edges bear off the centre of the roller, cut a strip of the composition off each end with a sharp knife.

Roller Fretting.—Put a roller on the slab in the proper place in the carriage, see what can be put between the end of the stock and the roller carriage (try a nonpareil first, or a pica), and what can be got in will be the proper amount to put in under the carriage; it will then lift the roller parallel to the slab. The real reason of "fretting" is because the roller drops too low in the carriage.

Suggestion for Inking Disks and Platens.—During cold mornings, when rollers will stick tight to the disk and cause much trouble and annoyance, a few drops of Glissol will obviate the difficulty.

Rollers and Blue Ink.—To avoid the streaky appearance so often seen in solid blue surfaces, more especially when ultramarines are used, see that the rollers are soft and do not carry too much colour.

To Clean Rollers used for printing Copying Inks.—It is best to avoid water, which always weakens them. Spirits of wine proves much more efficient; it takes the ink off immediately, does not injure the rollers, and, as it vaporizes almost immediately, they may be used directly.

Special Lye for Washing Rollers.—The following recipe has been found successful: 2 lb. washing soda (bruised), 2 lb. brown unslacked lime, and 2 oz. common table-salt mixed in three gallons of soft water, stirred. When settled, pour off the liquor, and throw the sediment away. When washing the rollers, sponge dry, with this lye only. It is ready for use in an hour.

Cleansing of Rollers.—For some time past use has been made of oil of camphor for cleansing rollers, type, woodcuts, machines, etc., in preference to turpentine, petroleum, and benzine. The qualities which recommend it as a cleansing agent are not to be overlooked. Firstly, it is cheaper than the other liquids; secondly, it is healthy, and acts as a disinfectant in the printing office; thirdly, it is as efficacious and as rapid in its action as any of the products employed up to the present; and fourthly, it contains no fatty matter, and leaves no deposit.

Rollers should be Cleaned at least once a day, never mind what is said to the contrary. A roller, like other things, needs washing occasionally.

Rollers and Brass Rule.—Some printers say that rollers will stand brass rule when working, and that it is the workman, and not the rollers, at fault. To prevent the rules cutting the rollers, some insert two pieces of wood, type-high, on each side of the chase, which act as roller bearers. They are sufficiently curved at one end to allow the rollers to pass on to them without that objectionable knock against the sharp edge of the rule which usually does so much damage.

INKS, VARNISHES, ETC.

THE MAKING OF PRINTING INK.—Ordinary printing ink consists of a strongly-carbonized black colouring matter and a fatty substance. The colouring matter is rich in carbon, and is usually obtained by the combustion of tar, naphtha, resin, etc., to which finely-pulverized charcoal is added. The vehicle is linseed oil, which is purified with sulphuric acid, and afterwards boiled in iron, or, preferably, copper cauldrons, till combustible vapours are emitted. These are ignited, and, after burning for some minutes, are extinguished by closing the cauldron. In factories where the vapours are not ignited in a closed cauldron, the oil is allowed to boil until of the required consistency. Treated in this manner, it does not penetrate the paper, and dries much quicker than ordinary oil. Its viscosity is increased by the addition of a certain quantity of colophony. The manufacture of printing ink consists of three operations: 1. Preparation of the black. 2. Preparation of the varnish. 3. Mixture and incorporation of the varnish with the black. The products used for the preparation of the black are fatty substances decomposed by heat. The gases produced by this decomposition are ignited, and a current of air carries the black into large chambers where it is deposited. The heavier black, which is the first to fall, is not used; but the lighter is carefully collected and employed in the manufacture of printing inks. The oil may also be burnt in lamps instead of being decomposed, and in this case the black obtained is used in the manufacture of fine inks only. But, whichever method is adopted, the black produced must before use be purified and divested of the fatty matters or tar which it may have retained. When this has been done by calcination in reverberators, the

black may be mixed with the varnish. Varnishes are of two kinds, one of which is produced by boiling drying oils, especially linseed oil. The other, used in the manufacture of news inks, is made of resinous oils or solid resin. The oils are first purified by decantation, and afterwards boiled till of the required consistency. After grinding, the mixture falls into a receiver, from which it is taken up. The proportions of black and oil, and the rapidity and fineness of the grinding, depend on the quality of ink required. Book inks should be of a deeper black than news inks. A larger quantity of black and much finer grinding are, therefore, necessary in the manufacture of these inks. Lastly, cut inks require the finest black, and very slow grinding. It may be said that the black used for fine cut inks undergoes no less than nine or ten different grindings.

The Changes in Printing Inks.—The invention of the half-tone block caused a revolution in the manufacture of printing inks, and especially of black inks. Before these blocks came into use, all blacks appeared black, because whether they were used on type work, or on line cuts, the solids were all comparatively large. But when the half-tone came into use, with its numberless little dots, it was found that the blacks were actually not black, but a deep brown, with a yellowish tone, which, while it had always existed, was only revealed by the half-tone. The ink makers used the best means at hand to overcome this difficulty, and to alter this tone of the blacks, which was done by adding toning colours, which were usually blue pigments. The selection of such agents was limited, and it was found that after a certain point the blacks ceased to be improved, but tended towards green or olive. Other toning agents gradually came into use, but on account of their comparative weakness, they robbed the black inks of their covering capacity; and, while inks so made were deep in shade, they gave weak and washy results when used on shallow cuts with fine screens. Again, the increasing speed of the presses, the desire to obviate slip-sheeting, and the tendency to turn out work in a rush, all had their bearing on the manufacture of printing ink. The inks as made for half-tone work were more or less of a compromise, but they could not do justice

to any of them. While this relates chiefly to black inks, it also refers to coloured inks; but these were, with very few exceptions, hardly suitable for half-tone work at all. Coloured inks were made for this purpose, but only because there was nothing better to be had. Almost all coloured pigments are very weak compared with black; therefore, to give the necessary intensity, these inks were frequently crowded with dry colour, which caused the half-tones to fill up, which every printer knows.

Some Words about Ink.—One cannot expect to produce good work unless good ink is used. One may have the best paper and employ the best workmen, but there will be something wanting in the appearance of the work, due to the use of inferior ink. It must not be inferred that this bad appearance is always the fault of the ink. Good ink in the hands of an inferior pressman will produce a worse result than bad ink in the hands of a competent workman. For the production of good work it is necessary to possess a knowledge of ink and how it should be treated under different circumstances. It is a fact, however, that there are comparatively few men with a practical knowledge of ink and its proper treatment. A knowledge of paper and how it is affected by ink is also of advantage to the practical printer, for it is absurd to purchase good ink simply to waste its fine qualities upon paper unsuited to its use. Printers must also remember that good ink and old rollers will not work well together. What is worth undertaking at all is worth doing well, whether it be a small job or a big one. Use good ink and the right paper, and if justice is done to both by a competent workman the result must be satisfactory.

Care of Printing Inks.—The great difficulty which printers have to contend with is getting an ink which will print a dense colour, and yet will dry sufficiently quick, so as not to soil the hand shortly after it leaves the press. Inks which have coal-tar colours for their basis are, as a rule, affected by water and varnish (being soluble and the colours running); whilst light and exposure to weather have a most destructive effect. Vermilion inks, when printed

from lead or iron types, cause sulphur combinations, which change the colour of the ink. It is needful, when used in machines with brass cylinders, to cover these with a coating of copal or damar varnish. Caution is needful in using tint inks upon tinted paper to prevent inharmonious combinations. By covering the top of ink in can, when opened, with oiled paper, or paper dipped in glycerine, skinning is prevented. For ultramarine inks, use oiled paper only, as glycerine affects this colour. In any special contracts it is advisable to send to the ink manufacturer a sample of paper used, and, where practicable, a small sample of the ink in ordinary use. As the quality of paper has much to do with the success or non-success of an ink, the following observations will be of interest: Notice whether white or brownish; a brown tint in paper makes ink look brown. If porous or glazed. If the tongue is pressed against it when porous, it will immediately get soft from absorbing the moisture, and become semi-transparent. Porous paper is, of course, less transparent, and with a strong ink is more apt to be torn; it requires, therefore, thinner ink.

Early Printing Inks.—Printing ink—which, in reality, is not an ink at all, but simply a jet-black oil paint—is shrouded as to its origin in no little obscurity. One thing is certain: the first printers must have realized at the outset that the thin-bodied ink made use of by the block printers and printers with wooden type was utterly useless in the manipulation of metal type, cut or cast. Who first conceived the idea of making use of a black paint in conjunction with metal type it is not recorded, but whoever he was his idea was no less valuable than the discovery of movable metal types, for without this ink that discovery would have remained a mere mechanical curiosity. Mixing colours with "drying" or "boiled oil" was known to German printers early in the fifteenth century. It must be borne in mind that ancient and mediaeval art made no use of oil colours. In fresco painting the colours are mixed with lime and applied upon the moistened surface of the plaster. In Gutenberg's Bibles and in the books of Fust and Schoeffer carbon oil paint or "printing ink" strikes the reader's gaze with a seeming depth and intensity of black-

ness unknown even in our day—a fact, however, due to the great quantity rather than quality carried to the paper by the heavy-faced gothic type. With the incunabula, as with modern books, the press work shows great inequality, running a gamut of colour from a gray, smeary black, with so slight a hold upon the paper that it may be readily sponged off with a little soap and water, to the rich, glossy black of the Aldine classics, as unchangeable to-day as it was at the beginning of the sixteenth century. Examined under a microscope, the ink of many incunabula presents a mottled appearance, due to imperfect incorporation of carbon and oil. In others there is yellow discoloration surrounding the printed line, a result of insufficient boiling in reducing the raw oil to a varnish or to the presence of adulterated ingredients.

Hints about Printers' Inks.—For all commercial work, printed on writing-paper, use ink with a good body —a short, thick ink covers better on writing-paper. For circulars or other work, printed on super-sized and calendered paper the same ink will answer, but a cheaper quality will do as well. For jobs on printing-paper the thinnest ink is best. Short ink and hard rollers, thin ink and soft rollers, go best together. Where there are solid surfaces to cover, thick ink is best, because it covers better. For the same reason short ink is cheaper than the tacky article. Never try to print cuts or fine work on good paper with a poor quality of ink. It does not pay. Use the thick-bodied, short ink for such work, especially on a platen press. Wash up at least once a day, even on long runs. The ink will become clogged with dust, and good work is then impossible. Always use the best of coloured inks, except for poster work. They are cheaper in the end. In opening a can of coloured ink of which little is required, do not pull the skin off the top; break it at the side, take out what is wanted, and immediately replace the skin. If you take the skin all off it will form again, and the ink will be wasted. Keep all ink-cans well covered. Dust will ruin any ink.

An Ink Maker's Hint to Printers.—A point which requires some elucidation is the remarkable difference produced from differing blocks. A process block used on a

dense, brilliant colour will only produce a pale effect, because what one really sees in the print of a process block is a combination of coloured and white dots, just as though a white pigment were blended with a coloured pigment. Printers who see an ink maker's specimen book printed in the solid are constantly disappointed by the poor results they get when they apply the inks to process work. A little reflection would often prevent a deal of dissatisfaction, because most ink makers prefer to issue specimens showing their full colour value on a good solid subject.

HINTS ON COLOURS.—There are occasions when printers are obliged to decline work, not from a want of knowing how to produce it, but from a lack of material to do it with. A bottle of inkoleum will reduce and refine the oldest and driest coloured inks to a consistency which will make them work free without injury to the colour.

Red Ink. If for fine work, procure a few ounces of the best vermilion powder, and mix it well with thick varnish, allowing the varnish to carry all the colour it possibly can; when commencing to grind with the colour stone and muller, do not despair if the mixture form itself into a ball resembling a lump of india-rubber; if this should follow, add plenty of muscle to the muller, and it will assume the consistency required. If the colour adheres to the inking-table, and the varnish attaches itself to the roller and the printing looks poor and without body, add a little of the inkoleum. If the red ink is for surface printing, use the middle varnish, and for poster or show work use thin varnish by itself.

Dark Blue Ink may be produced in the same way, by purchasing a few ounces of dark Chinese blue, but requires double the grinding of the vermilion, and must be ground in very small quantities at a time; by simply spreading with a palette knife it will be seen that it has a rough or smooth appearance—it will recover its smoothness instantly; do not be deceived by it without this test.

Light Blue Ink. A very pretty blue may be made by substituting a few ounces of Antwerp blue; proceed as in the former directions, but it will take more grinding than the vermilion, and less than for the Chinese.

Light Green Ink. To make this very little grinding is required, if the colour obtained is of the best quality. In other respects proceed as with the vermilion.

Dark Green Ink. Add to the above a small quantity of dark Chinese blue.

Crimson Ink. Use the purest carmine, well ground to a thick consistency; a very small portion of this added to the vermilion will give it "fire," and kill the brick-dust appearance.

Pink Ink. Lower the carmine with pure flake white.

Common Brown Ink. Add a small quantity of black to the vermilion.

METHOD FOR MAKING RED INK.—Red printing ink may be made in this way: Boil linseed oil until smoke is given off. Then set the oil on fire, and let it burn until it can be drawn out into strings half an inch long. Add one pound of resin for each quart of oil, and one half-pound of dry brown soap cut into slices. The soap must be put in cautiously, as the water in the soap causes a violent commotion. Lastly, the oil is ground with a pigment on a stone by means of a muller. Vermilion, red lead, carmine, Indian red, Venetian red, and the lakes are all suitable for printing inks.

THE GRINDING OF RED INKS.—An experiment in grinding a portion of carmine with the stone moulder and another portion of the same carmine in an ink mill, with iron or steel rollers, will convince any one that carmine loses a great deal of its brilliancy owing to the chemical action of the rollers which grow hot when in motion. The same effect is produced with other reds and colours, more or less. There are only a few ink mills with stone rollers in actual use in consequence of their cost, breaking or cracking whenever they become heated.

TO MAKE CHINESE WHITE.—Take as much as required of zinc white finely ground, put it on a marble or glass slab, mix it into a cream of the required consistence by adding mucilage of gum tragacanth, grinding with a glass muller. For quantity required to fill an ordinary sized

Chinese white bottle, add to the above 10 or 12 drops of thick gum arabic and 5 or 6 drops of pure glycerine, grinding well together.

Prepared Blue for Printing.—Oxide cobalt, 10 lb.; 12 oz. red lead. The above to be calcined in oven. Then pound, add 10 lb. of whiting, and send to mill to be ground.

The Mixing of Tints.—Let the colours of tints be delicate in tone, and in mixing them depart as much as possible from the primary colours. Nothing shows crudity of taste more than the invariable use of sheer blue, or red, or yellow, merely reduced by varnish and white. There are so many attractive combinations possible by intermixing, that there is no excuse save ignorance for such frequent resort to simple colours as is exhibited in many specimens that come to hand. Another common error is the use of black for darkening tints. Those who employ it do not realize that the moment black is thrown into the mixture the beauty of the tint is destroyed, its luminous character gone, its chance of transparency is lost, and a dullness spreads over it all. Use other colours for deepening, such as extremely dark blue, or very dark green, as the case may require. Above all, never choose a deep or strong colour for tint blocks where the tinted space is to be printed over in any part with type lines. Even where such lines are very bold and heavy, it is a risky proceeding, because the strong colour will disturb the eye and draw it away from the type lines, which are the main feature of the job.

Inks for Printing Safety Tints.—Two kinds of inks are to be considered for this work. The first is a colour which can be washed away entirely, being a pure water colour with glue or gelatine size, and is usually composed of colour which dissolves readily in water, say: dry colour, 10 parts; gum or glue, 4 parts; glycerine, 4 parts; water, 3 parts; to which is added more or less white, as the amount of colour is reduced to make tints lighter. The best way to print is in letterpress, on account of the litho mode of damping. The other is for litho use, and cannot be easily erased without soiling the paper or causing a disagreeable

change in the colour of the ink. Take a good wash colour, say cochineal, some of the anilines, indigo, carmine, saffron, etc., 30 parts; mix and grind with thin varnish (thinned in turpentine); then mix 5 parts Castile soap with a little oil of lavender, and gradually add to the colour. Reduce to proper shade with magnesia before adding soap. Oxalic acid will remove writing, but will not obliterate this printing, and yet change it to such an extent that it will be easily detected.

Reducing Tint Inks.—Colour for tint work is invariably toned down with varnish. If the colour appears mottled, add a little flake white to give it body.

Ink Slabs for Colour Work.—It has been suggested that all ink-tables on machines used for colour work should be nickel-plated. Iron kills bright colours, and renders tints dull and lifeless. The cost of the nickeling is trifling, and once done lasts a lifetime. Porcelain, litho, stone, marble, slate, and glass are all good surfaces to use for colour slabs.

Liquid for Brightening Common Qualities of Coloured Inks.—Take white of fresh eggs, but apply very little at a time, as they dry hard, and are likely to take away the suction of the roller if used for any length of time.

Reflection of Coloured Inks.—Mix a little of the white of a fresh egg with coloured inks at the time of use. This increases their reflection, and, at the same time, gives a siccative.

Ink Distribution in Winter.—Where there is no boiler or gas engine in use, a gas or oil stove in the machine-room will quickly pay for itself, because even if the inks be of a proper consistency, the machine which has stood over night in a cold or underground room chills everything with which it comes into contact, and the slab and ink duct also cause the ink to stiffen, all metals being cold to the touch in winter unless artificially warmed. If it is not feasible to have a stove, it certainly is a help to have a gas bracket

which may be swung into any position and brought underneath the ink duct. Sometimes gas stoves are fitted in the pit underneath big news machines with the best possible results, and even in a hot climate where the nights are cold the introduction of a steam coil into a tank in a newspaper office has also proved of great value.

Mixing Inks to Work in Cold Weather.—Do not mix coal-oil in job ink for this purpose, although it may sometimes be used in news ink with advantage, if applied sparingly and well mixed with the ink. Job ink, black, is generally made with linseed varnish—that is good black ink. A varnish made of half linseed oil and damar varnish is a better mixture than coal-oil, as it softens the body of the ink without destroying its quality.

Storage of Inks.—Temperature has more to do with disturbances in freedom of working of printing inks than any other factor. The ink which gave a perfectly satisfactory result on a hot summer's day, fails to work, clogs the machine, and causes a deal of trouble in cold weather. Much of this can be got over by storing inks in a warm place in winter and a cooler place in summer, but best of all would be the plan to exclude cold draughts of air from the machine-room as far as possible.

Printing Ink.—The following hint is useful, for it is, as a rule, only known to old-fashioned pressmen. The scrapings and dregs of ink-casks, skins of ink, scrapings of rollers, and waste ink generally, if sent to a small ink-maker to be remade up with some fresh ink, will turn out the best ink for a printer's use which can be obtained. Some good specimen-work has been done with ink thus compounded, the material having been laid aside for years as waste. If the printer has an ink-grinding machine he may make the ink himself.

Waste of Ink by Skinning.—All printing inks have a tendency towards drying or skinning on the surface, and the longer the ink is exposed to the air, the thicker the skin becomes, and the more ink adheres to the skin. Let the skin or paper disk be carefully drawn aside (all buyers

should insist upon a paper disk being supplied to cover their inks, just as jams and other preserves are protected from the air) and the supply of ink needed carefully taken from the centre of the tin, after which the paper disk should be carefully pressed down gently so as to fill up the cavity which has been formed. If this be done there will be very little waste. If, despite these precautions, the inks should be of such a quick-drying nature as to tend to become solid, a small quantity of tint-reducing varnish should be poured on to the surface of the ink, which will be effectual in excluding the air, because this has such a prejudicial effect in oxidizing, stiffening, and drying up the contents of the tin. Most ink makers are willing to supply inks at a very small additional charge in collapsible tubes if desired, and where fine inks are used, and small quantities required, this is the most economical method. It is not advisable for the printer to keep large stocks, for the ink maker is always willing to supply anything but the cheapest quality in one-pound tins if desired.

Another Way to Keep Ink from Skinning. — A simple and effective way of keeping ink cans air-tight till the last ounce of colour is used up is as follows: Old roller composition which is unusable for rollers is melted up with a little oil added, and poured into the cleaned-out and slightly oiled lids of the ink cans. While the composition is cooling, or before it has time to set, put into it a strip of cloth-backed card, the two ends of which stick out and act as handles to the mass of composition when set. Then, if the can is an old one, carefully clean the sides of it from any old and dry colour which may have stuck there, and also the surface of the ink from any skin which may have already accumulated. The composition disk comes easily out of the lid and is pressed down into the can till it rests on the surface of the colour. Here it excludes all air, as the lid, being slightly larger than the box, there is always pressure from the composition against the sides of the tin. The originator of the idea says that once it is tried it will be always used, and it is much cleaner and more practical than any of the present methods of pouring water, varnish, or inkoleum on the surface of the ink.

Dull Inks.—Inks intended for use in warm and moist temperatures are usually full bodied, and as a result often lack brightness. This dull appearance may be removed by the addition of a few drops of copal varnish to the ink before commencing the run. Should it then pull on the paper, add a little more ink and mix thoroughly.

The Sticking of Poster Sheets.—Poster ink, coloured or black, has a tendency to make sheets stick together as though they had been glued. Mixing a small quantity of soft soap with it will generally put matters right.

A Good Drier for Poster Inks.—Spirits of turpentine, one quart; balsam copaiba, six ounces. Add a sufficient quantity of ink to thin it to a proper consistency for working. This compound is one of the best that can be used as a drier; it brightens the inks and makes them work freely. Ruling-inks can be made to dry quickly by adding half a gill of methylated spirits to every pint of ink. The spirit is partly soaked into the paper and partly evaporates, and it also makes the lines firm.

Stiff Ink.—If ink should pull the face of paper, owing to frost or to the paper itself having a soft, spongy, or enamelled face, put a drop or two of oak varnish on the slab, and run up. If very frosty weather, it may be found necessary to heat the slab. Some firms keep a small gas jet arranged under each slab for these emergencies.

Thinning Ink.—A printer of large practical experience says that he thins his ink with spirits of turpentine, and works it with damar varnish previously thinned with raw (not boiled) linseed oil. The use of turpentine sets off, in the drying properties of the ink, the use of raw linseed. He has had, he says, most trouble with the red and green inks, both of which have been treated successfully in the manner described.

To Give a Silky Effect to Ink.—The new style of silk and satin lettering for showcards is produced as follows: Take an impression in any colour mixed with varnish, and dust it as in bronzing with powdered asbestos.

Printing Ink for Aluminum.—A good black ink is necessary for best results. What is known as fine, quick-drying job ink is a safe grade to use. Regular type will do for short runs, if properly made ready on press. For large numbers of cards from same forme the use of strongly faced electrotypes is suggested.

How to Improve Black Ink on Creamy Paper.—The brownish hue seen in black ink when printed on toned paper may be obviated by mixing a little blue ink with the black.

Ink to Print on Leather and not Rub Off.—Little or no difficulty should be experienced in printing on the usual grades of leather provided the ink is not too thin and oily. Employ a medium quick-drying job ink for all leathers except those specially prepared in oils, in which case use a little copal varnish in good, stiff, black or other colours of ink. Bookbinders' gloss inks may also be used when a rich gloss is desired.

Ink for Enamelled Cards.—For printing on enamelled cards add to good quality printing ink a composition of copal varnish 1 oz., mastic varnish 1 oz. Mix together, add twenty drops to the ink, and print. Old enamelled cards are better to print upon than new ones.

Bitumen for Printing Ink.—A useful suggestion has been made for utilizing bitumen. It is claimed that a natural semi-fluid bitumen or maltha, in varying degrees of density, exists in large quantities, and that much of it is adapted for use as a printing ink, for letterpress or lithography, with very little manipulation. It is elastic and tough, is indelible, and in drying quality is superior to most inks manufactured. It distributes perfectly, and is incomparable for the finest and most delicate cut work. In its natural state it prints a rich, dark gold colour, but can be worked into almost any colour desired by being ground with appropriate pigments. It can be thickened by boiling, or made thinner by the addition of linseed oil or a more fluid bitumen. If it realizes what is claimed for it, it will be a valuable aid to the printer.

Transparency Printing.—A German firm has succeeded in perfecting Transparent Coloured Inks of great clearness and brilliancy, the use of which will at once do away with the slow and expensive preparation hitherto necessary to give the transparent quality to the paper. With these colours the design must be printed on a thin wove bank paper, and each colour has to be printed twice in order to give it the necessary depth. When the sheets are printed and the last colour dry, the transparent varnish is poured into a flat, open pan, and the printed sheets drawn through the varnish, so that the paper gets equally wet on both sides. They should then be hung up to dry in a room free from dust, and in such a position that they will not stick together. The varnish should be kept well corked to prevent its evaporating. Transparency printing is now placed within the means of the ordinary printer, without expensive additions to his plant or appliances.

Improved Drier for Printing Ink.—Many of the driers that are now sold are not satisfactory. Printed work for which they are used not infrequently sets off, and is at all times difficult to handle. If the greatest care is not used there is spoilage. Here is a recipe supplied by a practical chemist, which deserves to be tried: A small quantity of perfectly dry acetate of lead or borate of manganese in impalpable powder will hasten the drying of the ink. It is essential that it should be thoroughly incorporated with the ink by trituration in a mortar.

Ink Drier.—Sulphuric ether, one ounce; refined spirits of turpentine, one-fourth ounce; mix and use in heavy lines. Use sparingly.

Hardening Gloss for Inks.—Dissolve gum arabic in alcohol or a weak solution of oxalic acid, and add it in small quantities to the ink in use.

Recipe for Printing Gloss Ink.—Take one pound of sugar of lead, one pound of white copperas, and half a pound of litharge oil, in a jar, which should be kept in a cool place. This preparation is printed from a solid block of a size covering as much of the already printed job as may be required to be glossed. It is very quick drying, and

only as much must be put on the ink-table at one time as will be sufficient for a few minutes' use.

Can for Printers' Ink.—This is a description of an improved one of American origin. The head of the can is made integral with the body, an egress for the ink being provided by a nipple, which is situated in the centre of the can head, and may be closed by a screw-cap. A movable bottom—described in the specification as a "concavo-convex follower"—is adapted to slide longitudinally within the body of the can, and is surrounded by annular packing which prevents leakage without restricting motion. If the screw-cap be removed and the bottom of the can pressed in, the ink will be forced from the nipple in the same manner that paints are exuded from the collapsible tubes which contain them. This can possesses the two principal virtues of collapsible tubes: the manner of ejecting its contents, and the protection it affords its contents against dust. It differs from collapsible tubes in that, owing to its rigidity, it preserves its form, and may be refilled when empty.

Handling of Small Cans of Ink.—A good plan is to remove the lid and place the tin in a black jar or pot slightly larger. Throw away the lid of the can and keep the ink workable by pouring on the top a little glycerine. The lid of the jar is then put on, and the whole can be used without soiling the fingers.

Ink for Bronze and Metal.—A mixture of equal parts of Canada balsam and copal varnish, or some japanners' gold size, may be employed as an admixture for temporary gold ink. A drop or two applied to the slab or roller will give sufficient tenacity to the ordinary ink to enable proofs to be pulled. For regular employment, the ink should contain some strong or middle varnish and some driers. The following is highly commended by some printers:

Middle Varnish	2 parts
White Wax	1 part
Venice Turpentine	1 ,,

Patent Driers and Burnt Umber, of each a sufficient quantity.

Fixing Inks on Enamelled Surfaces.—Add a little gold size to ink for printing on highly glazed or enamelled surfaces, and the colour will not rub off when dry.

Letterpress and Lithographic Inks.—There is a great difference between lithographers' and letterpress printers' inks, whether black or in colours. Printers can use lithographers' inks, and would do well to make use of them, but lithographers should never attempt to use printers' inks. Lithographers' inks, manufactured by reliable firms, are certainly the best for such purposes, because these inks have to be ground and mixed with suitable varnishes in order to obtain a solid and sharp printing, and a knowledge of this is necessary to make a suitable ink, while, in the case of printers' inks, manufacturers are not so careful, and are satisfied if the printer is able to obtain a smooth impression. To do the exact thing it is necessary to know just what materials we are working with, and particularly in the case of inks we must know the ingredients, so that we can tell what chemical actions will result, and also how they will work upon the stone in the lithographic process, and with the paper used for printing upon.

Lithographic Ink.—This is a recipe useful to amateur lithographers and others: Wax, 16 parts; tallow, 6 parts; hard tallow soap, 6 parts; shellac, 12 parts; mastic in tears, 8 parts; Venice turpentine, 1 part; lampblack, 4 parts. The mastic and lac, previously ground together, must be heated with care in the turpentine; the wax and tallow added after they are taken off the fire, and when the solution is effected the soap shavings must be thrown in. Lastly, the lampblack is to be well intermixed. Whenever the union is accomplished by heat, the operation is finished; the liquor is left to cool a little, then poured out on tables, and, when cold, cut into square rods. Lithographic ink of good quality ought to be susceptible of forming an emulsion so attenuated that it may appear to be dissolved when rubbed upon a hard body in distilled or river water. It should be flowing in the pen, not spreading on the stone; capable of forming delicate traces, and very black to show its delineations. The essential quality of the ink is to sink

well into the stone, so as to reproduce the most delicate outlines of the drawing, and to afford a great many impressions. It must, therefore, be able to resist the acid with which the stone is moistened in the preparation, without letting any of its greasy matter escape.

Powdered Red in Lithography.—The ink is composed of strong varnish, medium varnish, and Baltimore yellow, well ground. The following proportions may be taken as the basis: Strong and medium varnish, and an equal quantity of Baltimore yellow. Well mix the varnishes, add the yellow, and grind the whole thoroughly. Pressure being sufficiently heavy, the yellow should appear very distinct. Its shade is by no means harmful to the red. On the contrary, the yellow strengthens the red. When the red powder tints the white parts of the paper, a small liqueur glass of linseed oil should be used to a plate of powder. Mix with a piece of card until the colour has entirely absorbed the fatty body. The addition of this quantity of oil, rendering the powder fatty, prevents it soiling the paper.

Photo-Lithographic Inks.—The ingredients for photo-lithographic inks are: Printing ink, 23 parts; wax, 50 parts; tallow, 40 parts; colophony, 35 parts; oil of turpentine, 210 parts; Berlin blue, 30 parts.

Typewriting Inks.—Some of these are fugitive, that is, they will not stand exposure to strong sunlight. Purple, red, and green, if exposed for a great length of time, will fade. Red will fade out completely, and for that reason very few red ribbons are made. Purple being a colour very much liked, it became a question with manufacturers how to render it permanent, and this has been done by simply adding carbon, which is indestructible, to the purple ink, making what is known as "black-copying purple." This ribbon prints black, but, of course, in making a letter-press copy the copy is purple. The original takes a purplish tinge. The copy, if exposed, is liable to fade, but it is as lasting as the greater number of the ordinary fluids. The original is permanent, being rendered so by the carbon. There is an indelible ribbon, writing a deep blue-black and making a strong blue copy. This is perhaps the best for

all purposes, as both the copy and the original are absolutely permanent. Ordinary printing ink may be used if a black is required.

Re-Inking a Typewriter Ribbon.—In two ounces or more of any ordinary writing fluid put a spoonful of thick gum-arabic mucilage and a teaspoonful of brown sugar, warm the mixture, and immerse the ribbon long enough to become well saturated. When dry, spread the ribbon on a board, and brush it well with glycerine. Should there be too much "colour" in the ribbon, press it out, between papers, with a warm flat-iron; or, if too dry, brush it again with glycerine. The secret of the ribbon giving out its colour is in the glycerine, and if there is body enough in the colour there is no danger that it cannot be made to work well. Such a ribbon is not affected by the dryness or humidity of the atmosphere. It is necessary that the ribbon should retain a certain degree of moisture, for the gum and sugar make it dry and harsh, so the glycerine coat is put on; but there is danger of smearing the paper with too much moisture, or a wrinkled surface, and the ironing obviates this.

Typewriter Ribbon Ink.—Aniline black or violet, half ounce; pure alcohol, 15 oz.; concentrated glycerine, 15 oz. Dissolve the aniline in the alcohol and add the glycerine.

Another Ink for Typewriter Ribbons.—To make this, take vaseline of high boiling point, melt it in a water bath or slow fire, and incorporate by constant stirring as much lampblack as it will take up without becoming granular. Remove the mixture from the fire, and while it is cooling mix equal parts of petroleum, benzine, and rectified oil of turpentine, in which dissolve the fatty ink introduced in small portions by constant agitation.

Printing Copying Ink.—To the ordinary printing office copying ink is troublesome. As usually done it means either a set of rollers or a spoiled job, perhaps both. Copying ink is hard on rollers, and grease is fatal to copying

ink. Where there is only an occasional job of this class it is well to have it always done on the same press and to keep a set of rollers for that purpose. Always wash the press plate up carefully with lye and rinse with water before putting up the ink, and keep a special set of rollers —have them made rather harder than the ordinary rollers, and do not wash them, but roll them up in a sheet of paper a trifle longer than the composition part of the rollers, and keep them in a dry box; there is glycerine enough in the ink to keep them in condition. Clean rollers, clean forme, and clean plate are half the battle. Use only good quality copying ink, it goes a long way, and the best costs very little for each job, and saves its extra price in the little trouble it gives.

To Clean Rollers after using Copying Ink.—Some one, referring to the use of copying ink, recently suggested that the price of a new set of rollers should be added to the cost of the job. It has been experienced that it is not the ink, but the usual water-bath which causes all the trouble, and the latter can be entirely avoided in the following manner: After finishing the run, wash the disk clean with a wet rag. Cut three or four sheets of tough check or some other smooth-coated board about two inches longer than the rollers and wide enough to cover the plate. Lay one of these sheets on the disk, holding it so that it will not roll up. Run the rollers up slowly as far as they will go. Run them down again, and repeat this operation until there is very little ink remaining on them, after which apply a heavy layer of good black ink, and all will be well. When washed up with benzine it will be found that all traces of the copying ink have disappeared. Not a drop of water touches the rollers and hence they are in no worse condition than if the job had been run with any other ink.

Working Copying Ink.—When copying ink is difficult to work on platen machines, drying upon the disk every few minutes, a little glycerine may be added and well mixed with the ink. A few drops of water sprinkled on the disk when coated with ink will afford temporary relief.

Another Copying Ink Wrinkle.—By the following means a copying ink job is handled as quickly as any other. A set of rollers and a brayer are kept especially for black ink jobs, and maintained in good condition by allowing the ink to remain on them and then covering over with a few drops of machine oil when not in use. When a copying ink job comes along, clean the black ink rollers by putting some suitable cleanser on the disk and running the rollers over it several times, then lay a newspaper on the disk and run the rollers over the paper until no stain of the black ink shows. The brayer is cleaned in the same manner. The dead ink remaining on the rollers and brayer prevents the copying ink from penetrating below the surface. When the job is finished they can be cleaned with water, and are again ready for use with black ink. Use a small quantity of ink and a moderately hard tympan.

Copying Ink has a peculiar propensity to enter into even the smallest pores on the surface of the rollers, whence to dislodge it is in most cases difficult and wearisome. To avoid that, rub the rollers with a solution of chrome-alum, one part of the latter to nine parts of water, and let them dry before using.

Red Copying Ink.—Dissolve 50 parts of extract of logwood, in a mortar, in 750 parts of distilled water without the aid of heat, add 2 parts of chromate of potassium, and set aside. After twenty-four hours add a solution of 3 parts of oxalic acid, 20 parts of oxalate of ammonium, and 40 parts of sulphate of aluminium, and 200 parts of distilled water, and again set aside for twenty-four hours. Now raise it once to boiling in a bright copper kettle, add 50 parts of wood vinegar, and after cooling fill into bottles which must be corked. After a fortnight decant. This ink is red in thin layers, writes red, gives excellent copies in brownish colour, and turns blackish-brown upon the paper.

Violet Copying Ink.—The following formula is for the preparation of a violet copying ink: 40 grams extract of logwood, 5 grams oxalic acid, and 30 grams alum are dissolved in 800 grams rain water and 10 grams glycerine, and the whole allowed to stand for twenty-four hours. The

ink is then brought to the boiling point in a copper vessel and 50 grams wood vinegar are added, and, after standing for a while, the ink is put into bottles.

More Hints on Copying Inks.—This class of ink is so unlike ordinary printing ink in its composition as to bewilder the printer in his first attempts at using it. It bears about the same relation to common inks that water-colours do to oil colours. While printing ink has oil for one of its component parts, copying ink is entirely free from it, and in using it every particle of oil must be removed from the rollers and from the disk. The rollers should be cleaned with benzine, unless they are very hard, when lye may be used and the rollers slightly sponged. They should be allowed to dry thoroughly before the ink is put on. Hard rollers do better work with copying ink than soft rollers, and new rollers can hardly be induced to take the ink at all. Formes for copying ink should be made ready in black, and, when the forme is ready to run, the press washed up and the copying ink put on, after which the press should be run steadily, as copying inks usually dry very rapidly when exposed. When the rollers begin to stick on the disk and the forme works badly, draw a sponge saturated with water along their full length—or put on a few drops of glycerine—and run a few revolutions without printing, when the proper colour will be restored and the job will work cleanly. If the job cannot be made to work properly it is because the rollers are too sticky or a little oil has got mixed in with the ink. In either case wash up and try again. Copying ink is as easy to work as any other when its peculiarities are once learned, and it will do just as clean printing on ordinary type formes.

To Make Stencil Ink.—A good and cheap stencil ink, in cakes, is said to be obtained by mixing lampblack with fine clay, a little gum arabic or dextrine, and enough water to bring the whole to a satisfactory consistency.

Erasible Ink Stencil.—This can be made of lampblack or bone-black, one ounce; yellow soap, one dram; water sufficient; mix and beat into a paste.

Stencil Blue Ink.—Shellac, 2 ounces; borax, 2 ounces; water, 25 ounces; gum arabic, 2 ounces; and ultramarine sufficient. Boil the borax and shellac in some of the water till they are dissolved, and withdraw from the fire. When the solution has become cold, add the rest of the 25 ounces of water and the ultramarine. When it is to be used with the stencil, it must be made thicker than when it is to be applied with a marking brush.

Engravers' Transfer Ink.—The compound used by wood engravers to make a transfer from a print on to a type-metal block consists of one ounce of caustic potash to half a pint of alcohol, made into a solution, with which the print is wetted for a few minutes. The type-metal block is then brushed over with Canada balsam, the picture put on face down, and the two run between rollers.

Soap in Transfer Ink.—Soap as an ingredient of transfer ink cannot be superseded. It is an alkali, mixed with a fatty substance. There are several forms of alkali used in its manufacture, such as soda, potash, and ammonia, and the acids chiefly used are oleic, stearic, palmitic, and margaric. Soda is generally used in the manufacture of hard soap. Soda soap is generally used in the hard plate ink, used in England for plate transferring to stone, because stearic acids are used. Hence it forms a harder body, which seems to be most popular with some workmen. Soap causes the other ingredients forming the ink to be soluble in water. Its use is limited, and great caution is to be observed as to the quantity used.

Plate Transfer Ink.—A good plate transfer ink may be made with the following ingredients: Take 4 ounces each of tallow, wax, soap, shellac, pitch, and lithographic ink, and melt the materials in the order named. Burn the first three for fifteen minutes, put out the flame, and then add the shellac. When the shellac is dissolved, add the rest. Continue the heat for another fifteen minutes without setting on fire. Let a piece get cold, and, if not found hard enough, continue the heat until the necessary degree of hardness is arrived at, which may be known by its breaking with a sharp sound.

Rubber Stamp Ink.—The following proportions are said to give an excellent ink, which, while not drying up on the pad, will yet not readily smear when impressed upon the paper: Aniline red (violet), 90 grains; boiling distilled water, 1 oz.; glycerine, $\frac{1}{2}$ teaspoonful; treacle, half as much as glycerine. The crystals of the violet dye to be powdered and rubbed up with the boiling water, and the other ingredients stirred in.

Another Method.—It is said that another endorsing ink, which does not dry rapidly on the pad, and is quickly taken by the paper, can be obtained by the following recipe: Aniline colour in solid form (blue, red, etc.), 16 parts, 80 parts boiling distilled water, 7 parts glycerine, and 3 parts syrup. The colour is dissolved in hot water, the other ingredients being added whilst agitating. This endorsing ink is said to obtain its good quality by the addition of the syrup.

Indelible Ink for Rubber Stamps, which is said not to injure the rubber, is made of boiled linseed oil varnish 16 parts, best lampblack 6 parts, perchloride of iron 2 to 5 parts. It should not be used for metal type.

Endorsing Ink is made of Prussian blue well ground up with linseed oil.

Ticket Writers' Ink is made of good black ink with liquid gum added in the proportion of half an ounce of gum to a gill of ink. Set in a warm place and shake up occasionally till well mixed. If wanted very glossy add more gum, always remembering that increasing the quantity of gum makes the ink less easy in working.

Cardinal Ink for Draughtsmen.—The solution of carmine lake in caustic aqua ammonia has this disadvantage: that, in consequence of the alkaline properties of ammonia, the cochineal pigment will in time form a basic compound, which, in contact with a steel pen, no longer produces the intense red, but rather a blackish colour. To avoid this, prepare the ink thus: Triturate 10 grains of pure carmine with 150 grains of acetate of ammonia solu-

tion and a like quantity of distilled water, in a porcelain mortar, and allow the whole to stand for some time. In this way a portion of the alumina, which is combined with the carmine dye, is taken up by the acetic acid of the ammonia salt, and separates as precipitate, while the pure pigment of the cochineal remains dissolved in the half-saturated ammonia. It is now filtered, and a few drops of pure white sugar syrup added to thicken it. In this way an excellent red drawing ink is obtained, which holds its colour a long time. A solution of gum arabic cannot be employed to thicken this ink, as it still contains some acetic acid, which would coagulate the bassorine, one of the constituents of gum arabic.

Stamping Inks.—For red ink, dissolve one-fourth of an ounce of carmine in two ounces of strong ammonia, and add one dram of glycerine and three-fourths of an ounce of dextrine. For blue colours, rub one ounce of Prussian blue with enough water to make a perfectly smooth paste; then put one ounce of dextrine, incorporate it well, and finally add sufficient water to bring it to the proper consistency.

Indian Ink.—A colour apparently identical with Indian ink can be produced by the action of sulphuric acid on camphor. An excess of camphor should remain some twenty-four hours in strong sulphuric acid; it then results in a gelatinous mass of a slightly reddish colour. This, when heated, effervesces, gives off fumes of sulphurous acid, and turns intensely black. By evaporation the superfluous sulphuric acid and camphor (for there remains an excess of both, the weakened acid not acting on the camphor) can be driven off. The remainder, when applied to paper as a paint, appears to be Indian ink. When dissolved in water it remains an indefinite time without precipitating. It appears to be dissolved, not held in suspension.

Indelible Indian Ink.—Draughtsmen are aware that lines drawn on paper with good Indian ink which has been well prepared cannot be washed out by mere sponging or washing with a brush. Now, it is proposed to take advantage of the fact that glue or gelatine, when mixed

with bichromate of potassa and exposed to the light, becomes insoluble, and thus renders Indian ink, which always contains a little gelatine, indelible. This ink is made by adding to the common article, when making, about one per cent. of bichromate of potash in a very fine powder. This must be mixed with the ink in a dry state, otherwise the ink could not be ground up easily in water. Those who cannot provide themselves with ink prepared as above in the cake, can use a dilute solution of bichromate of potash in rubbing up the ink; it answers the same purpose, though the ink should be used thick, so that the yellow salt will not spread.

QUICK-DRYING INDIAN INK.—This ink for drawing may be improved so that even the thickest lines will quickly dry by adding one part of carbolic acid to eighty of the Indian ink. If too much acid is added it may be rectified by putting in more Indian ink. If the mixture is properly formed the ink is as easy to draw with as it is without carbolic acid, but dries quickly, and may even be varnished without discharging.

CHINA (OR INDIA) INK.—This ink is used for writing with a brush, or painting, on one side only of the paper by the Chinese. It is rubbed down on a porcelain slab, or palette, and used with a fine camel-hair brush for painting upon the soft, smooth, flexible rice paper employed by Chinese artists, which is such a peculiarly characteristic product of those ingenious Orientals. China ink, so far as is known, was the earliest artificial ink made, and it is still in general use in China and Japan. It has been used in India so long as to have obtained the name of Indian ink. In Europe it is employed to some extent by architects and engineers, and also by artists, who use it for designs or sketches in black and white, for which it possesses the advantage of affording various depths in shading according to its greater or less dilution with water. It is made of lampblack and size or animal glue, with the addition of perfumes or other substances not essential to its quality as an ink. It is usually prepared in the form of small sticks, which are formed in wooden moulds.

Indestructible Ink.—India ink, and many other varieties of ink containing considerable quantities of carbon, are practically indestructible—that is, they are far more permanent than the material on which they are used, as paper in time becomes exceedingly brittle and friable. A very good formula is the following, which is said to yield an ink much resembling that forming the characters upon Egyptian papyrus: Make a solution of gum lac in an aqueous solution of borax, and add to this a sufficient quantity of lampblack to give the proper black coloration. This ink is said to be almost indestructible, resisting both time and chemical agents, and yielding a beautiful lustrous black. The printing press has, for the general preservation of literary treasures, largely reduced the necessity for indestructible materials upon which to record them permanently, since they may readily be duplicated and distributed. But the question of the preservation of important public records upon more lasting materials than wood paper and indifferent inks, will doubtless make itself felt as a grave necessity before long.

Imperishable Ink.—The nearest approach yet discovered is made by grinding up good Chinese or Japanese Indian ink in a saturated solution of borax. The Indian ink is itself imperishable, but can be washed off from paper before the borax solution fixes it.

Black Writing Ink.—Take six ounces of the best gall-nuts, and pound them in a mortar or otherwise; take four ounces of logwood, and let it be cut or ground into very small pieces; these, mixed with four quarts of rain or river water, must be boiled together until half diminished. Then take two ounces of copperas made into a powder, and three ounces of gum arabic; let these be also mixed and strained through a linen cloth. After this mixture has stood a few hours it may be written with. The ink thus prepared is very fine, and makes the writing appear beautiful and shining. Another old-time recipe is the following: Take three quarts of rain water and sixteen ounces of pounded gall-nuts; boil these on a slow fire until the liquor has diminished two-thirds; then throw into it two ounces of

gum arabic, which has been already dissolved in half a pint of vinegar, then add six ounces of powdered copperas; boil for two hours longer, then bottle for use.

Cheap Black Ink.—A German paper gives the following: Extract of Campeachy wood 100 parts, lime water 800 parts, phenol (carbolic acid) 3 parts, hydrochloric acid 25 parts, gum arabic 30 parts, red chromate of potash 3 parts. The extract is first dissolved in the lime water on a steam-bath with frequent stirring or shaking; after this the carbolic and hydrochloric acids are added, which change the red colour to a brownish yellow. It is then heated half an hour on steam-bath and set aside to cool. It is next filtered, and the gum and bichromate, dissolved in water, are added. Enough water is added to make up the solution to 1,800 parts. This ink, red when first used, quickly turns black.

Vanishing Black Writing Ink.—To make an ink, black at the time of writing, which shall disappear after a short time, boil gall-nuts in aqua vitae, put Roman vitriol and sal ammoniac to it, and when cold dissolve a little gum in it. Writing done with this ink will vanish in twenty-four hours.

Recipe for Blue-Black Writing Ink.—The following recipe is published in response to several inquirers. To 1 lb. of bruised galls add a gallon of boiling water; $5\frac{1}{2}$ oz. copperas in solution; 3 oz. gum arabic in solution; and a few drops of carbolic acid. Finally add a strong solution of fine Prussian blue, in sufficient quantity to turn the ink a blue-black when written with. This ink afterwards turns a jet-black, and cannot be erased either by acids or alkalies without destruction of the paper.

Coloured Writing Inks.—Those which are not fugitive—that is, which will not fade and into which it is safer that aniline colours should not enter—may thus be made: *Red.*—Four oz. ground Brazil wood, and 3 pints vinegar, boiled till reduced to $1\frac{1}{2}$ pint, and 3 oz. powdered rock alum added. *Purple.*—To a decoction of 12 parts Campeachy wood in 120 parts water, add 1 part subacetate of copper, 14 parts

alum, and 4 parts gum arabic; let stand 4 or 5 days. *Violet.*—Boil 8 oz. logwood in 3 pints water, till reduced to $1\frac{1}{2}$ pint; strain and add $1\frac{1}{2}$ oz. gum, and $2\frac{1}{2}$ oz. alum. *Blue.*—Two oz. Chinese blue, 1 quart boiling water, 1 oz. oxalic acid; dissolve the blue in the water, and add the acid; it is ready for use at once. *Green.*—Two oz. verdigris, 1 oz. cream of tartar, $\frac{1}{2}$ pint water; boil till reduced one-half, and filter.

Yellow Writing Ink.—Dissolve one ounce of picric acid in one gallon of boiling water, first having mixed the colour in a little alcohol (this is done best with mortar and pestle); add a little gall, if found necessary; generally flows free enough without gall.

Green Writing Ink.—Dissolve one ounce of Hoffman's permanent malachite green in one gallon of hot water; add a little gall and alcohol; reduce with cold water to the required shade.

Sea-Green Writing Ink.—Add blue indigo paste to the picric acid yellow, sufficient to give the shade required; add gall when using, same as other inks.

Lithographic Writing Ink.—Almost all the tushe (as this is called) in the market cracks easily and does not flow well from the pen upon zinc. This may be remedied by preparing a tushe, in the usual manner, of 8 parts white beeswax, 5 parts Castile soap, 15 parts shellac, 1 part mastic (in drops), 10 parts dragon's blood, 6 parts tallow, and 1 part lampblack. Form into sticks, and when using dissolve one part of this tushe in ten parts of boiling water. This tushe has proved the very best for work upon zinc.

Chrome Writing Ink.—This useful, cheap, and almost unalterable ink can be made according to the following recipe: Distilled water, 1,000 parts (by weight); logwood extract, 16 parts; carbonate of soda (cryst.), 2 parts; chromate of potassium, 1 part. Dissolve the logwood extract in 900 parts of water by aid of heat, and let it stand to settle; draw off the clear liquid, heat to boiling, and add the carbonate of soda; lastly add, drop by drop, with con-

stant stirring, the chromate (yellow chromate) previously dissolved in 100 parts of water. The colour is not fully developed at once, but on standing for a few hours gradually deepens to a full bluish black. The ink thus prepared flows well and dries quickly. The addition of a trace of clove oil will prevent mouldiness.

Glossy Writing Ink.—Any common writing ink can be made glossy by adding to it a little gum arabic or white sugar. If the latter is used, care must be taken not to use too much sugar, else the mixture will be sticky when dry; and if too much of either gum or sugar is used, the ink will become too thick to flow well.

To Prevent Spreading of Writing Ink on Tissue use a fair proportion of gum arabic.

White Ink for Pen Drawing.—Mix pure freshly precipitated barium sulphate or flake white with water containing enough gum arabic to prevent the immediate settling of the substance. Starch or magnesium carbonate may be used in a similar way. They must be reduced to impalpable powders.

Gold Ink.—For making gold ink take equal parts of iodide of potassium and acetate of lead; put them in a filter, and pour over them twenty times the quantity of warm distilled water. As the filtrate cools iodide of lead separates in golden scales. This is collected when the filtrate has quite cooled, washed with cold water in a filter, and rubbed up for an ink with a little mucilage. The ink must be shaken every time it is used.

Recipe for Silver Ink.—This is white gum arabic, one part; distilled water, four parts; silicate of soda in solution, one part. Triturate with the best silver bronze powder enough to give the required brilliancy.

Gold and Silver Inks.—An improved method of making gold and silver inks is to triturate purified gold or silver in metallic powder with a solution of one part of white gum arabic in four parts distilled water and one potash water-glass.

INK TABLETS.—The demand for ink tablets or powders is limited, though the form is extremely handy for carrying on a journey. Two recipes for preparing ink tablets are here given: 1. Extract of logwood, 500 parts; alum, 10 parts; gum arabic, 10 parts; neutral chromate of potassium, 1 part. Dissolve the salts in 500 parts of water, add the extract of logwood and gum arabic and concentrate the mixture to the consistency of an extract. Then pour the mass out either into moulds or into a flat-bottomed dish, and cut it in pieces of suitable size, which may be enclosed in boxes or other receptacles. 2. Extract of logwood, 100 parts; gum arabic, 10 parts; indigo carmine, 5 parts; neutral chromate of potassium, 1 part; glycerine, 10 parts; water, q. s. Proceed as in the preceding formula.

FROST-PROOF INK.—Aniline black one dram, rub with a mixture of concentrated hydrochloric acid one dram, pure alcohol 10 ounces. The deep blue solution obtained is diluted with a hot solution of concentrated glycerine 1½ dram, in four ounces of water. This ink does not injure steel pens, is unaffected by concentrated mineral acids or strong alkalies, and will not freeze at a temperature of 22 or 24 degrees below zero.

SYMPATHETIC INK.—An ordinary solution of gum camphor in whisky is said to be a permanent and excellent sympathetic ink. The writing must be done very rapidly, as the first letters of a word have disappeared by the time the last are written. Dipping the paper in water brings it out distinctly, and it becomes invisible again when the paper is dried. It can be brought out repeatedly without affecting its vividness.

AN INVISIBLE INK.—To make the writing or drawing appear which has been made upon the paper with the ink, it is sufficient to dip it into water. On drying, the traces disappear again, and reappear by each succeeding immersion. The ink is made by intimately mixing linseed oil, 1 part; water of ammonia, 20 parts; water, 100 parts. The mixture must be agitated each time before the pen is

dipped into it, as a little of the oil may separate and float on top, which would, of course, leave an oily stain upon the paper.

Old Manuscript Ink.—The following formula is said to have been in use in 1654, and to have produced an ink of great permanency, if one may judge from manuscripts written by the person who is the authority for the formula: One and a half dram of coarsely powdered galls, six drams of sulphate of iron, ten drams of gum arabic, and one pint of soft water, are to be placed in a bottle, which is to be securely stoppered and placed in the light (sunlight if possible). Stir occasionally until the gum and copperas are dissolved, after which the bottle should be shaken daily. In the course of four to six weeks the ink will be fit for use. The addition of ten drops of carbolic acid will prevent the formation of mould.

Ruling Inks.—The following is a good recipe and drier: Sulphuric ether, one ounce; refined spirits of turpentine, one-quarter ounce; mix and use in heavy lines, but use sparingly.

White Ruling Ink.—Chinese white, mixed with water containing enough gum arabic to prevent the immediate settling of the substance, makes a good white ink for ruling purposes. Magnesium carbonate may be used in the same way. Both must be reduced to impalpable powder.

Drier for Ruling Inks.—Ruling inks are made to dry quickly by using half a gill of methylated spirits to every pint of ink. The spirit is partly soaked into the paper and partly evaporates; it also makes the lines firm.

Orange Ruling Ink.—To make this, mix red and yellow in proper proportions to the shade desired; there is no set rule for quantity; add a few drops of ammonia to set the colour.

Sea-Green Ruling Ink.—To make this ink add blue indigo paste to picric acid yellow, enough to give the shade desired; add gall when using, just as for other inks.

A Recipe for Marking Ink.—Take nitrate of silver 11 grains, dissolve in 30 grains of aqua ammonia. Dissolve 20 grains of gum arabic in 85 grains ($2\frac{1}{2}$ teaspoonfuls) of rain-water. When the gum is dissolved, put in the same phial also 92 grains of carbonate of soda. When all are dissolved, mix the contents of both phials together, and place the phial containing the mixture in a basin of water, and boil several minutes, or until a black compound is the result. When cold it is ready for use.

Another Black Marking Ink.—A good, serviceable marking ink for use on linen without preparation is made as follows: Dissolve separately one ounce of nitrate of silver and one and a half ounce of best washing soda in distilled or rain water. Mix the solutions and collect and wash the precipitate in a filter; while still moist rub it up in a marble or Wedgwood mortar with three drams of tartaric acid; add two ounces of distilled water, mix six drams of white sugar, ten drams of powdered gum arabic, half an ounce of archil, and water to make up six ounces in measure.

Red Marking Ink.—A German formula which is said to be unaffected by either soap, alkalies, or acids, is the following: Enough finely pulverized cinnabar to form a moderately thick liquid is very intimately mixed with egg albumen, previously diluted with an equal bulk of water, beaten to a froth and filtered through fine linen. Marks formed on woven tissues with this liquid, by means of a quill, are fixed after they have become dry by pressing the cloth on the reverse side with a hot iron. The ink will keep in well-closed bottles for a long time, without separation of the suspended cinnabar.

Marking Ink without Nitrate of Silver.—One dram of aniline black is rubbed up with 60 drops of strong hydrochloric acid and $1\frac{1}{2}$ oz. of alcohol. The resulting liquid is then to be diluted with a hot solution of $1\frac{1}{2}$ dram of gum arabic in 6 oz. of water. This ink does not corrode steel pens, and is unaffected either by concentrated mineral acids or by strong lye. If the aniline black solution is diluted with a solution of $1\frac{1}{2}$ oz. of shellac in 6 oz. of alcohol,

instead of with gum water, an ink is obtained which, when applied to wood, brass, or leather, is remarkable for its black colour.

INDELIBLE INK.—A cheap indelible ink can be made thus: Dissolve in boiling water 20 parts of potassa, 10 parts of finely-cut leather chips, and 5 parts of flowers of sulphur, the whole heated in an iron kettle until it is evaporated to dryness. Then the heat is continued until the mass becomes soft, great care being taken that it does not ignite. The pot is now removed from the fire, allowed to cool, water is added, and the solution strained and preserved in bottles. This ink will readily flow from the pen.

ANOTHER INDELIBLE INK.—The appended formula is for a crimson marking ink: Dissolve 1 oz. nitrate of silver and $1\frac{1}{2}$ oz. carb. soda in crystals, separately, in distilled water. Mix the solutions, collect, and wash the precipitate in a filter; introduce the washed precipitate, still moist, into a Wedgwood mortar, and add to it tartaric acid 2 drs. 40 grs., rubbing together until effervescence ceases. Dissolve carmine, 6 grs., in liquor ammonia (0·883), 5 oz., and add to it the tartrate of silver, then mix in white sugar, 6 drs., and powdered gum arabic, 10 drs., and add enough distilled water to make 6 oz. This ink is red when written with, but becomes black.

INDELIBLE ANILINE INK.—It is necessary, to render this ink indelible on paper, to coat the reproduction with some preparation. An excellent compound consists of collodion dissolved to the consistency used by photographers, with two per cent. stearine added.

GOLD LEAF.—If a sheet of gold leaf is held up against the light it appears to be of a vivid dark green colour; this means that the light is transmitted through the leaf. When it is considered that this leaf is a piece of solid metal, a better idea of the extreme thinness of the leaf can be comprehended than by any comparison with figures; nothing made by the hand of man equals it in thinness. This extreme tenuity is produced by patient hammering, the hammers weighing from seven to twenty pounds, the

lighter hammers being first used. When the true method of this beating is understood the wonder expressed sometimes that gold-leaf beating should not be relegated to machinery ceases; the art belongs to the highest department of human skill and judgement. Apprentices have served a term and have been compelled to abandon the business because they never could acquire the requisite skill and judgement combined necessary to become successful workmen. The material for gold leaf is coin gold. The gold is precipitated by muriatic and nitric acids over a fire to separate the gold and silver, the copper of the alloy passing off in the heat. The silver from gold coin amounts to about seven pennyweights in £150 worth of coin.

A Hint for Gold Printing.—To prevent gold-leaf or bronze adhering to the surface beyond the outline of the sizing, pounce the whole of the surface after sizing with whiting, or lay on with a soft brush whiting mixed with water, brushing off superfluous powder when the water has evaporated. The varnish or gold size may be distinctly seen over this whitish ground as the gilding progresses.

Gold Size.—1. (Oil size.) Drying or boiled oil thickened with yellow ochre or calcined red ochre, and carefully reduced to the utmost smoothness by grinding. It is thinned with oil of turpentine. Improves by age. Used for oil gilding. 2. (Water size.) Parchment or isinglass size mixed with finely ground yellow ochre. Used in burnished or distemper gilding.

Substitute for Gold Size.—Few printers have not had trouble with the gold size regularly furnished by inkmakers. Not only has it a tendency to dry on the rollers and on the forme, but it too frequently dries on the sheets before the bronze can be dusted on. This result suggests the employment of the very poorest grade of bronze, even where the finest gold is used. Again, the regular stock size is more than likely to fill up the finer lines of engravings and shaded letters wherever employed, giving a dirty, muddy effect, as though too much ink had been used. Reflection will show how inevitable this result must be where such an extra-glutinous and quick-drying pigment is

constantly thickening and hardening on the delicate hair-lines of a job, necessitating frequent stops and washings. This is a drawback to fine work, but it can be remedied by the employment of a substitute which does away with the above objections. It is made as follows: Take three parts of lemon yellow ink and one part of No. 2 varnish, and mix well; add about one-twentieth of the above quantity of copal flock varnish, and mix perfectly. The peculiar quality of this size is that it can be run all day without washing it—an impossibility with the other; it never thickens the [illegible] works freely on and off the rollers, and allows sheets to lie longer without bronzing than any other method. The bronze shows less liability to smut or spread, and much cleaner and brighter work is produced, showing fully covered lines, instead of parts that seem only half bronzed. This size, being slow to set, gives the bronzer a better chance to cover the job, but for this very reason holds more firmly and permanently every grain that is spread upon it.

Japanners' Gold Size.—Powder finely of asphaltum, litharge, or red lead, each one ounce; stir them into a pint of linseed oil, and simmer the mixture over a gentle fire or on a sand-bath till solution has taken place, scum ceases to rise, and the fluid thickens on cooling. If too thick when cool, thin with a little turpentine.

Hints about Bronze.—There should be no trouble in making bronze stick if it is of good quality and the size is well made and the press thoroughly washed up. This last cause is the one which gives the pressman the most bother, as a very slight particle of oil will give him trouble. There is some chemical which enters into the colouring of some of the dark colours of paper and cardboard which repels bronze ordinarily; this is particularly noticeable in maroons. The only way to circumvent this is by a good sound impression, thus getting the bronze below the surface of the page.

Imitation Gold Lacquer.—The preparation of the real Chinese gold lacquer is a secret, but an excellent imitation may be prepared by melting two parts of copal and one of

shellac, so as to form a perfectly fluid mixture, and then adding two parts of hot boiled oil. The vessel is then to be removed from the fire and ten parts of oil of turpentine gradually added. To improve the colour, addition is made of a solution in turpentine of gum gutta for yellow and dragon's blood for red in sufficient quantity to give the desired shade. The Chinese apparently use tin-foil to form a ground, upon which the lacquer varnish is laid.

To make Gold Bronze.—Melt two parts of pure tin in a crucible and add to it, under constant stirring, one part of metallic mercury, previously heated in an iron spoon, until it begins to emit fumes. When cold, the alloy is rubbed to powder, mixed with a part each of chloride of ammonium and sublimed sulphur, and the whole enclosed in a flask or retort which is embedded in a sand-bath. Heat is now applied until the sand has become red-hot, and this is maintained until it is certain that vapours are no longer emitted. The vessel is then removed from the hot sand and allowed to cool. The lower part of the vessel contains the gold bronze as a shining gold-coloured mass. In the upper part of the flask or retort, chloride of ammonium and cinnabar will be found.

Composition for Bronze Work is a mixture of chrome yellow and varnish. The chrome is well ground with a muller into the varnish. This gives the bronze, especially gold, a fuller tint than if the plain varnish only is used. It answers equally well for copper, citron, or emerald bronze. To give silver bronze a deep appearance ordinary dark blue ink may be used.

Facilitating Bronze Printing.—Calcined magnesia rubbed on a job will allow of bronze being printed over a colour without adhering to it, but the colour should be as dry as possible before applying the magnesia.

New Size for Gold Bronze.—On account of similarity in colour, yellow is generally regarded as the best medium for bronze jobwork, particularly chrome yellow, which has been used for that purpose in most printing offices. It is said that the so-called Indian yellow is better adapted for

the purpose. Although the colour is rather strong, its printing qualities are unexcelled, as it covers well and imparts a gold-leaf-like appearance to the printed bronze. Especially is this the case when printing on coloured glazed papers, as it will, unlike other colours, adhere as firmly to this kind of surface as to any other.

A Bronze or Changeable Hue.—A bronze or changeable hue may be given to inks with the following mixture: Gum shellac, $1\frac{1}{2}$ lb., dissolved in one gallon of 95 per cent. alcohol or Cologne spirits for twenty-four hours. Then add 14 oz. aniline red. Let it stand for a few hours longer, when it will be ready for use. When added to good blue, black, or other dark inks, it gives them a rich hue. The quantity used must be very carefully apportioned. In mixing the materials, add the dark colour sparingly at first, for it is easier to add more, if necessary, than to take away, as in making a dark colour lighter its bulk is increased considerably.

A Good Black Varnish.—By means of a gentle heat dissolve 50 parts of powdered copal in 400 parts of oil of lavender; add 5 parts of lampblack and 1 part of powdered indigo.

Bookbinders' Varnish.—The best recipe for making varnish for full calf extra work is as follows: 3 pints of spirits of wine of 40 per cent., 8 oz. shellac, 8 oz. sandarach, 2 oz. mastic in drops, 2 oz. Venice turpentine; apply lightly on the book with a piece of cotton wool, a small sponge, or a brush.

A New Varnish.—The base consists of paper treated with nitro-sulphuric acid and camphor dissolved in alcohol. The varnish is composed of this ingredient, with acetic ether, sulphuric ether, castor oil, Venetian turpentine, methylated alcohol, acetate of amyl, and pure crystallizable acetic acid in definite proportions. This varnish is said to have the following properties: It is unaffected by water and humidity, and will also resist weak and concentrated acids, and likewise alkalies, if contact be not too prolonged; it takes a fine polish. It can only be applied to surfaces

warmed either by the sun, before the fire, or in an oven at the temperature of 35° to 45° centigrade. If applied to a cold surface it becomes white, and the coat is wanting in coherence and possesses none of the qualities of the same varnish applied to a warm surface. Any kind of brush may be used for applying it. It dries in two minutes at the outside, so that twenty-five or thirty coats may be applied per hour. It may be rendered more flexible, and may then be applied to cold surfaces by adding crystallizable acetic acid and acetate of amyl.

Green Transparent Varnishes for Metals.—Grind a small quantity of Chinese blue with double the quantity of finely powdered chromate of potash (it requires the most perfect grinding); add a sufficient quantity of copal varnish thinned with turpentine. The tone may be altered by adding more or less of one or the other ingredients.

Picture Varnish.—Gum mastic, 6 ounces; pure turpentine, 4 drams; camphor, 2 drams; oil of turpentine, 19 ounces. Add first the camphor to the turpentine, and heat them over a water-bath until solution is effected. Then add the gum mastic and the essential oil of turpentine, and finely filter through cotton wadding. The varnish, on being kept several months, improves in toughness and brilliancy. It is to be applied with a fine varnish brush; when quite dry it will stand washing without injury.

Clear Shellac Varnish.—To get an absolutely clear solution of shellac has long been a desideratum, not only with microscopists, but with all others who have occasional need of the medium for cements, etc. It may be prepared by first making an alcoholic solution of shellac in the usual way; a little benzole is then added and the mixture well shaken. In the course of from twenty-four to forty-eight hours the fluid will have separated into two distinct layers, an upper alcoholic stratum, perfectly clear, and of a dark red colour, while under it is a turbid mixture containing the impurities. The clear solution may be drawn off.

QUICK-DRYING VARNISH FOR PAPER BOOK COVERS.—Add to the varnish a solution made as follows: 6 ounces mastic, in drops; 3 ounces coarsely powdered glass, separated from the dust by a sieve; 32 ounces spirits of wine of 49°. Place the ingredients in a sand-bath over a fire, and let them boil, stirring well. When thoroughly mixed introduce 3 ounces spirits of turpentine, boil for half an hour, remove from the fire, cool, and strain through cotton cloth. Great care in manipulation is requisite to avoid a conflagration. Use a close fire and watch incessantly.

THE VARNISHING OF PAPER.—To make size for wall-paper, break some glue up small, put it into a pail and cover the glue with water, and allow it to soak for ten or twelve hours; then add more water and boil until dissolved. Strain it through a muslin cloth, and try the size on a piece of paper. If it glistens, it is too thick; then add water. If it soaks into the paper it is too thin. Be careful, especially in the first coat, to bear very lightly upon the brush, and have plenty of size to flow freely from it, otherwise you may damage the paper. Give two coats of this, and when dry varnish with pale varnish, which should be applied very briskly, and leave off at the flow.

WHITE VARNISH FOR PAPER.—The following is the same as that used for foreign wood toys, and is composed of tender copal, one and a half ounce; camphor, 1 ounce; alcohol of 95 per cent., 1 quart, to which, when dissolved, is added mastic, 2 ounces; Venice turpentine, 1 ounce. The whole is then dissolved and strained. This varnish is extremely hard.

NEW PRINTING VARNISH.—The composition is: two parts of painters' terebene, one part of linseed oil, and one part of Canada balsam turpentine. The painters' terebene may be manufactured by boiling half a pint of linseed oil and two drams oxide of lead together for an hour, with incessant stirring, afterwards adding a few drops of acetic acid. To impart the glaze, instead of the Canada balsam there may be used two pounds of pale, hard copal, one pint of linseed oil, and three pints of turpentine, dissolved together. By the use of the above, it

is claimed that the inks are rendered impervious to sun, rain, and bill-posters' paste for a considerable time, as well as giving an increased brilliancy.

Rubber Varnish.—The waste scraps of vulcanized rubber—a mixture of rubber and sulphur—which can be had in abundance, furnish an excellent and quick-drying varnish. Its colour can be varied from a golden yellow to the deepest brown. It sticks very well to metals, and can be employed on electric apparatus. The clippings are put into a deep earthenware pot, covered with a tight lid, and set upon the fire. At the end of five minutes take the pot off and see if the material is melted. While on the fire take care not to lift the lid up, because the vapours which would be thrown off take fire easily. After the rubber is all melted, so that it can be poured out, and there are no more whole pieces to be seen, pour it into a flat basin. The basin should be rubbed with grease beforehand, and after the mass is cooled it is readily detached. Then break into pieces, put it into a large bottle, pour on some benzole and rectified spirits of turpentine, and well shake the mixture. The solution being complete, pour out the liquor to get rid of the impurities and hardened rubber which remain at the bottom, and a very limpid, beautiful, and excellent varnish is obtained.

Elastic Flexible Varnish for Paper.—This may be applied without [illegible] the article, and is prepared as follows: [illegible] and clear pieces of damar into small grains; introduce a convenient quantity —say forty grains—into a flask, pour on it about six ounces of acetone, and expose the whole to a moderate temperature for about two weeks, frequently shaking. At the end of this time pour off the clear saturated solution of damar in acetone, and add, to every four parts of varnish, three parts of rather dense collodion; the two solutions are mixed by agitation, the resulting liquid allowed to settle, and preserved in well-closed phials. The varnish is applied by means of a soft beaver-hair pencil, in vertical lines. At the first application it will appear as if the surface of the paper were covered with a thin white skin. As soon, however, as

the varnish has become dry, it presents a clear, shining surface. It should be applied in two or three layers. This varnish retains its gloss under all conditions of weather, and remains elastic; the latter quality adapts it especially for maps and similar things.

Varnish in Colour Printing.—In the manipulation of colours nothing forms a more important factor than the varnishes with which the pigments are mixed. It matters not how pure and well-ground these may be if the consistency of the varnish is unsuited to the peculiar colour to be made into printing ink. A practical knowledge of this branch of work is seldom attained; although there is no reason why any one should not learn all that pertains to colours and their treatment in the manufacture of ink. To be a good pressman a wide range of study in the manipulation of colours is necessary. It matters not how thorough a person's ability may be to make ready a forme, his dexterity in getting it worked off, or his precision in the management of work; if he lacks sound, practical knowledge of colour-making, he is still deficient in his business. To such a one a lack of this knowledge is at times the cause of large outlay and waste to employers, who, from a want of personal practical insight, allow their workmen to guess what is required. Nor should there be a want of attention or information in the matter of paper used in printing. This part of a printer's study is as important as colour manipulation, for there are excellent inks which will not work on some papers. To overcome this a familiarity with paper surfaces and the materials used in their manufacture is essential.

To Test Japan and Varnish.—Japan, like varnish, must be good to give entire satisfaction, and much damage is done by using a poor article. One way of testing a japan is to spread some on a piece of glass and leave it in the direct rays of the sun. When it has entirely lost its fluidity, scratch it lightly with the nail, and if it falls in powder without cracks its quality is proved good. This is also said to be a good way of testing varnish. The liquid which begins to enamel in places is of an inferior quality.

To Make Lye.—Use one pound of pearlash to three quarts of water, or one pound of potash to five quarts of water.

Another Recipe for the same.—To make a good lye for printers' use: Dissolve 28 pounds of soda in 52 gallons of water, to which add 7 pounds of soft soap boiled. Stir well together.

How to keep Lye.—How many printers keep their potash, pearline, etc., under proper conditions? All agree that it loses its strength long before it has been used, but few consider the cause of its becoming comparatively useless so soon after being made. The best way to keep it in condition is in an iron pan with a closely-fitting lid, *and the lid kept on*. If this were generally adopted there would be fewer complaints, as it would be found to retain its strength for a much longer period.

A Simple and Effective Lye.—Table salt, 2 oz.; unslacked lime, 2 lb.; washing soda, bruised, 2 lb.; put together in 3 gallons of soft water, stirred well. When settled ready for use, pour the liquor off, and throw the sediment of the lime away.

Black Bordering.—The best shining black ink, used for mourning paper, which has up to the present time been kept a secret by makers, may be prepared of lampblack, borax, and shellac. The ink is made as follows: In 1 litre of hot water 60 grammes of borax are dissolved, and to this solution three times the quantity of shellac is added. After this mixture has been properly dissolved, the necessary quantity of lampblack is added, the whole being constantly stirred. Should the lustre not be satisfactory, more shellac is added.

How to Remove Aniline Ink from the Hands.—Aniline inks are now in common use, especially in connection with the various gelatine tablets for multiplying copies of written matter. Upon the hands it makes annoying stains, difficult of removal by water or acids. They may be easily washed out by using a mixture of alcohol, three parts, and glycerine, one part.

Aniline Black for Printing on Cloth.—The following is recommended: (*a*) 25 parts aniline oil are mixed cold with 20 parts nitric acid at 38° R. (*b*) 50 parts starch, 30 tragacanth, 35 acetic acid, and 20 potassium chlorate, are boiled with 200 parts of water. (*c*) A solution of ammonium vanadate equal to 2 per cent. of the aniline oil in (*a*) is mixed with (*a*) and (*b*). The mixture is printed, aged, and the goods worked off in a slightly alkaline bath of potassium chromate.

Diamond Ink for Glass.—The ink used for writing or etching upon glass is composed of ammonium fluoride dissolved in water and mixed with three times its weight of barium sulphate.

Transparent Paint for Glass is made by rubbing the colours chosen in a size made of Venice turpentine, two parts, and spirits of turpentine, one part.

Ink for Writing on Glass.—This can be made by dissolving in strong hydrofluoric acid enough gum arabic to make the liquid flow readily from a pen without being viscid, and to colour it with cudbear or other colouring matter which will stand an acid, so that the writing may be visible. The solution must *not* be made in a glass vessel, but is best made in a rubber bottle. When a portion is poured out, it should be poured into a platinum or lead vessel, or into a rubber nipple set up in a small wide-mouthed bottle. Care must be taken that the acid be not brought in contact with the skin, as it produces painful and troublesome sores.

Cardboard Enamel.—Take one pound of parchment cuttings, one quarter-pound of isinglass, one quarter-pound of gum arabic and four gallons of water; boil in an iron kettle until the solution is reduced to twelve quarts; it is then removed from the fire and strained. Then divide into three parts of four quarts each; to the first portion add six pounds of white lead ground fine in water, to the second portion add eight pounds of white lead, and to the third add six pounds of white lead. The sheets of paper or cardboard are stretched out upon flat boards, and brushed

over with a thin coat of the first mixture with an ordinary brush; the paper is then hung up to dry for twenty-four hours. Then the paper is ready to receive a coat of the second mixture, and again hung up to dry for twenty-four hours; the paper is again treated in the same way with the third mixture, and dried for twenty-four hours. Finally, it receives a high gloss, which is obtained by laying the work face downwards on a highly-polished steel plate, and then passing both with great pressure between a pair of powerful rollers.

An Enamel for Artistic Purposes.—This may be prepared from a mixture of 30 parts, by weight, of saltpetre, 90 parts of silicic acid, and 250 parts of litharge. Drawings can be made upon this enamel as upon paper, and the characters can be burnt in by means of a muffle in less than a minute. It can also be employed in the preparation of photographs without using collodion. For this purpose a mixture of ten parts of gum, one of honey, and three of bichromate of potash, well filtered, is dried upon the enamel and exposed in the camera, the image being then developed by dusting over it a powder of ten parts, by weight, of oxide of cobalt, ninety of finely pulverized iron scales, a hundred of red lead, and thirty of sand; the chromate is decomposed by immersion in a slightly acidulated bath. When washed and dried the enamel is melted by placing it upon a piece of clean sheet iron, coated with chalk, and the photograph glazed upon the enamel is then brought to view.

Black Enamel for Brass Plates.—The enamel on brass signs, by which the letters cut into the metal are filled up, is made by mixing asphaltum, brown japan, and lampblack into a putty-like mass; fill in the spaces and clean the edges with turpentine.

Preserving Ink, Gum, or Paste.—It is said that a quarter per cent. of formic acid added to ink, gum, paste, and such articles, will keep them as fresh as possible.

Printers' Size.—Common soda, ¼ lb.; 1 lb. soft soap; 1 gallon water.

Calico Printing Dye.—The black dye used is obtained from myrabolans, a highly astringent fruit imported from India and other Eastern countries.

Pheasant Colour.—Whiting, 9 parts; 9 parts flint; 1 part prepared oxide cobalt.

Turkey Red by a New Process.—A method has been introduced for producing the beautiful Turkey red from alizarine. A certain quantity of Turkish red oil is dissolved in water, with a percentage of alizarine added, as also tannin. This mixture is slowly heated to a boiling temperature, and a solution of aluminum sulphite added, of 1·1014 specific gravity, which has been previously mixed with twenty-two per cent. of soda crystals. On prolonged boiling, the alizarine lake separates out, this being freed from excess of oil by washing with ether. It then forms a powder of splendid carmine-red colour, which is constant in the light, and is not attacked by dilute acids and alkalies. It still contains a certain quantity of oil, which cannot be removed by ether, but which gives the lustre to the preparation. When mixed in a thorough manner with water, the lake can be used for dyeing tissues in shades similar to those produced by eosine.

Ink Extractor.—For ruling inks: Saturated solution of chloride of lime, one ounce; acetic acid, one ounce. Use when freshly made. For black ink: A weak solution of oxalic acid.

Printing Oil.—Linseed oil, 1 quart; 1 pint of rape oil; 1 oz. balsam of copaiba; $\frac{1}{2}$ oz. of pitch; $\frac{1}{2}$ oz. of amber oil; $\frac{1}{2}$ oz. of white lead.

Luminous Paint.—White luminous paint has been known for some years, and chiefly used for watch dials, match boxes, and other small objects, but all attempts to produce luminous paints of various colours have hitherto failed, owing to the fact that the sulphuret of calcium, the principal constituent, is decomposed by the metals contained in the usual colours, whereby not only the luminosity, but also the colour, is destroyed. G. Schatte, of Dres-

den, however, has succeeded in producing red, blue, green, and other coloured paints, which have the quality of shining in the dark with the same colour which they possess in the daylight. It is easy to see that a variety of artistic effects may be produced by means of such business colours.

Restoring Writing on Old Deeds.—The faded ink on old parchments may be so restored as to render the writing perfectly legible. Moisten the parchment or paper with water, and then pass over the lines in writing a brush which has been dipped in a solution of sulphide of ammonia. The writing will immediately appear dark, and this colour it will preserve. Parchment records treated in this way in the Museum at Nuremberg ten years ago are still perfectly legible. On paper, however, the colour gradually fades away; but by the application of the sulphide it can be restored; for the iron which enters into the composition of the ink is transformed by the reaction into black sulphide.

A Peculiar Ink Plant.—There is in New Granada a plant, *Coryaria thymifolia*, which might be dangerous to our ink manufacturers if it could be acclimatized in Europe. It is known under the name of the ink-plant. Its juice, called *chanchi*, can be used in writing without any previous preparation. The letters traced with it are of a reddish colour at first, but turn a deep black in a few hours. This juice also spoils steel pens less than common ink. The qualities of the plant seem to have been discovered under the Spanish administration. Some writings intended for the mother country were wet through with sea-water on the voyage; while the papers written with common ink were almost illegible, those with the juice of the ink-plant were quite unscathed. Orders were given in consequence that this vegetable ink was to be used for all public documents.

WAREHOUSE WORK, STATIONERY, ETC.

THE PRACTICAL TESTING OF PAPERS.—Different qualities of paper are tested by various means. The strength is measured by its resistance to tearing. In machine papers the strength and stretching power vary according as the force acts lengthwise or across; in hand-made paper there is little difference. In the former the difference is in the proportion of 2·3, according to the direction of the tearing force. The stretching power acts inversely on the strength, that is, is greater across than lengthwise. To test the resistance of paper to the most varied mechanical wear, it is crumpled and kneaded between the hands. After such treatment a weak paper will be full of holes, a strong paper will assume a leathery texture. The test also gives a rough idea of the composition of a paper, much dust showing the presence of earthy impurities, while breaking up of paper shows over-bleaching. The thickness of paper is gauged either by measuring the thickness of a certain number of sheets, or by taking that of a single sheet by means of a micrometer, where the paper is placed between two rules, one fixed and the other movable, acting as a pointer showing the thickness of the paper on a dial. Over three per cent. of ash shows the presence of clay, kaolin, heavy spar, gypsum, etc. Microscopical investigation of paper aims at determining the kind and quality of paper. For this a magnifying power of 150 to 300 diameters suffices, when by colouring the paper with a solution of iodine, a yellow coloration shows the presence of wood fibre, a brown one that of linen, cotton or flax, and no coloration that of cellulose. The determination of the kind and quality of size may

be made by boiling in distilled water and adding a concentrated solution of tannic acid—flocculent precipitate shows the presence of animal size; and by heating in absolute alcohol and adding distilled water, when a precipitate shows the presence of a vegetable size.

THE SELECTION OF PAPER.—Papers made from flax and hemp are smooth, fine, substantial, solid, and strong, and are the best for works which have to stand much handling, and are expected to last a long time. Paper made of cotton is rough, spongy, soft, and loose in structure. At present, wood is a great medium in the manufacture of paper, and a large percentage of it is used. There are two processes for working up the wood for conversion into paper, which give different results and effects. One way is to grind it, the other is to reduce it by chemical action. Wood pulp is by no means adapted to produce a fine paper which can be used for any kind of art printing. Paper made from it is brittle, and turns yellow or brown when the air and light reach it. The durability of the paper and its value in preserving colours depend also very much upon the bleaching. If the bleaching agent is not neutralized thoroughly, the acid, which will accumulate to a greater or less degree, will not only destroy the colours, but cause even plain black to lose all its effect. Paper for the best art work should be absolutely free from wood and minerals, and not too much bleached. The sizing of the paper is also to be taken into consideration, for copper and steel engraving and heliogravure produce the best results on a soft, rough-surfaced paper. Photogravure and lithography are greatly benefited by the use of a little smoother-surfaced, better-finished paper.

ON JUDGING PAPER.—When writings are yellow wove, azure laid, or blue, they are frequently darker on one side than on the other. When the paper is darker in colour on the right side it is handmade; when darker on the wrong side it is machine-made. This method of distinguishing cannot be taken as conclusive without corroboration from other sources, for means are now taken on the machines in some mills to counteract the subsidence of the blue pigment. It

may happen that this rule fails, owing to a high finish having been imparted to the right side of a machine paper, by which it would become darker on that side. An unsought watermark is impressed by the wire cloth on all papers made by machine. It is indelible. No after-process of surfacing can obliterate it. It is always present in laid machine-papers, but is never found in laid handmades. The mark, which is a facsimile of the wire cloth, owes its existence principally to the suction of the exhaust boxes; and according to the intensity of their action on the fibre, so does the texture-like impression in the finished sheet vary. Hence it is more distinct in some papers than others. With a very fine wire, light action in the exhaust boxes, and a good finish afterwards, these wire marks get so faint that they are only discernible on looking through the sheet at a strong light. Two marks, laid and wove, in the same sheet, are an infallible indication of the sample being made by machine.

A Talk on Paper.—A little knowledge of paper is a dangerous thing, for although general appearance, colour, and texture are factors in deciding upon the suitability of papers, they are not everything. Long experience of a practical character is required to enable paper to be properly selected. It requires a close acquaintance with paper to be able to judge of its properties, and to know not only the first cost of buying but that of handling and working. How is the "outsider" to understand that a paper which suits one class of work is perhaps entirely unsuitable for another for which, at the same time, a paper of apparently identical colour, appearance, and weight may be just what is required? Details of finish, material used, or special process of manufacture may account for this, but such conditions have usually to be found out by experience. Such knowledge is not general even amongst experienced printers, and largely because they are not sufficiently observant in making comparisons and in noting the various grades of papers. Every printer should be acquainted with the details of paper-making; he should know what are wood-pulp, rag, and handmade processes; know how the presence of this or that constituent may or may not affect

his ink, how colour and surface are obtained, and their effect on type and blocks, and particularly for colour printing. The rapid growth of the paper-making industry requires from the man who would be fully acquainted with the material upon which he prints, not a spasmodic study, but regular and careful examination, if he is to be able to take full advantage of the market. Quite apart from this, there is a very hard business fact to be remembered—it pays to understand paper. The constant improvements made in manufacture provide a paper of to-day, for instance, quite as good as that of yesterday, but at a lower price, and a variety for selection and an astonishing number of qualities to suit the variety of work now demanded. The printer must understand paper from his own practical point of view, or he is handicapped in dealing with one of the most important constituents of printing.

The Origin of Paper-making.—The Chinese led the way in this as in many other cases, although parchment and papyrus may be considered the forerunners of paper. It is recorded that the Emperor Tiberius put very heavy taxes on the importation of papyrus, which were repealed by Theodoric, King of the Goths. From the invention of paper by the Chinese one hundred and twenty-three years before Christ may be traced the transition stages in substance from bamboo, papyrus, and rags, down to the modern materials, such as esparto, straw, cellulose, and the various ingredients now employed in the finer branches of manufacture. It may also be mentioned that the first paper-making machine used in England was constructed in 1803 from the designs of an engineer named Donkin.

Early Paper-Makers.—William Caxton's successor, Wynkyn de Worde, printed a book in 1498 on white paper, and states in the preface that the paper used was made in England by John Tate. Tate's mill at Stevenage was well known, and was considered worthy of special notice by Henry VII, who paid two visits to the mill, and on each occasion rewarded the owner—on 25th May, 1498, and again in 1499—a record of the rewards he gave being found in his household book. Sir John Spielman, although a

German, was a paper-maker there in 1588, and was knighted for his prominence as such by Queen Elizabeth, he employing the extraordinary number of six hundred workmen. That Spielman did employ six hundred men there is no room for doubt, as his great success was chronicled in various ways. In comparison with paper-making of to-day, his efforts and his enterprises are alike remarkable.

Ancient Paper.—From a microscopical examination of the paper from El-Faijune, preserved in the Austrian Museum at Vienna, in the collection known as "Papyrus Erzherzog Rainer," it has been proved that linen rags were used in the manufacture of paper as early as the eighth and ninth centuries. The fibre is chiefly linen, but there are also traces of cotton, hemp, and animal fibres present. The manufacture of paper out of rags is therefore an Eastern and not a German or an Italian invention, as has hitherto been supposed. Out of five hundred Oriental and Eastern specimens, not a single one was a raw cotton paper. All those that were examined had also been "clayed" like modern paper.

How to Test Wood-Paper.—Lack of durability in wood-paper is often an embarrassment to book publishers, who cannot always decide upon the material which goes to compose the paper submitted to them for examination. The most certain way to discover wood-pulp paper is to take a drop of an acid composed of three-fourths nitric acid and one-fourth sulphuric acid. The paper wetted with this one drop will have a brown stain if there is wood-pulp in the paper. Experiments recently made in the testing of paper by means of this acid showed the following results: White paper, entirely free from wood-pulp, is barely coloured by the acid, the part wetted taking a slight gray tint after drying. Wood-pulp paper assumes a dark brown colour immediately on the application of the acid. With a very little experience the amount of wood in the paper under test may be approximated from the rapidity of the discoloration, the shade of the stain, and the dimensions of the gray-violet ring around the spot produced by the acid. In coloured papers the changes worked by the acid vary:

blue wood-pulp paper gives a green stain, red paper a yellowish brown, green paper a reddish brown.

A Simple Test for Printing Paper.—Apply the tongue for sizing, and compare opposite sides together for equality of surface. Look through against strong light for spots, and note whether the paper be "regular." Printing paper ought to "rattle" well, and have good strength and surface. When there is a great "rattle," and if the paper has a glistening brilliancy of texture, then most likely straw is present in the fibre, which, when introduced in excessive quantities, causes the paper to break when folded. The paper should, therefore, be creased and then examined.

How Handmade Papers are Made.—Handmade paper is formed, one sheet at a time, on what is technically termed a mould—a light wooden frame traversed with thin slats $1\frac{1}{4}$ inch apart, and the whole covered with fine wire-cloth; it is fitted loosely inside another frame, which is termed the "deckle," and forms an elevated border all around the mould. Machine paper is made on a continuous web of felt in a Fourdrinier machine. The difference between the two is that the paper made on a hand-mould is thoroughly felted in all directions and is subjected to no strain while being finished, and therefore retains all its normal strength in length and width. With machine-made papers the fibres lie more in one direction than in another, and in transferring from one section of the machine to another, and subsequently, while in the web form, it is strained in the same direction—a weakening process as compared with handmade. For this reason manufacturers of ledger and similar papers in which strength is required are careful to keep the tension of the paper between the different sections of the machine as light as possible, but even then considerable difficulty is experienced in securing strength equal to that obtained by the hand process.

Japanese Handmade Paper.—The Japanese beat the world for handmade paper. It is especially good for etching, and is greatly in vogue among artists. It is exceed-

ingly durable and highly finished, and prints upon it are very much finer than on any other quality of paper. The handmade parchment paper is made from the inner bark of the sycamore tree, which has a very tough fibre, and it is beautifully finished. The Japanese Government has in its possession official documents printed on this parchment, which are as good as new to-day, after 1,500 years' wear and tear. The Japanese themselves use this paper for houses, coats, umbrellas, screens, and every imaginable purpose. The manufacture of handmade paper is now being principally conducted by the Japanese Government as a national enterprise.

HANDMADE PRINTING PAPERS.—Many choice editions of books are printed on a specially prepared handmade paper, and most of it has a rough surface. The printer who receives it for the first time is frequently at a loss to know the best method of treatment. Some attempt to work it dry, and others imagine that but little water is required. Both ideas are erroneous, and much loss and trouble in the working of these papers is occasioned by a lack of experience as to the best way of dealing with them. They need a plentiful supply of water; must be well turned and pressed, and allowed to stand for three or four days before sending to the machine-room. This paper, though having a rough surface, if treated as described, will be found to print initial letters, borders, and blocks with perfect success.

THE LIFE OF PRINTING PAPERS.—A German scientist has made some careful examinations into the composition and durability of printing papers. The question was whether the printed matter of to-day will be in existence fifty years hence. The question would appear to be almost foolish on the face of it, and yet the proportion of printing papers that have fifty years' wear in them is very small. Out of the papers upon which ninety-seven periodicals were printed, only three were perfectly satisfactory; while it was estimated that the paper of thirty-one others contained so much cellulose of wood and straw, and so much mineral matter, that they were hardly likely to last more

than half a century. Of the remainder of the periodicals, the paper was still less satisfactory.

THE LARGEST SIZE OF PAPER MADE BY HAND.—This is called "antiquarian," and should measure $52\frac{1}{2} \times 30\frac{1}{2}$ inches. There is obviously no special limit to the size of machine-made paper. Of course the breadth is fixed by that of the machine, but the length is practically unlimited while the machine goes and the "stuff" holds out.

SOME PRICES OF LEADING PAPERS.

	Weight.		Ream.		Retree.		Quire.
WHATMAN'S—	lb.		*s.* *d.*		*s.* *d.*		*s.* *d.*
Foolscap ...	16	...	21 6	...	18 0	...	
	18	...	26 0	...	20 6	...	1 6
Post	17	...	25 6	...	20 6	...	
	20	...	26 6	...	22 6	...	
Large Post	11	(bank)	27 6	...	20 6	...	
	17	...	27 6	...	20 6	...	
	20	...	31 0	...	26 0	...	
	23	...	32 6	...	28 0	...	1 11
	28	...	38 0	...	32 6	...	
Medium ...	13	(bank)	32 6	...	26 6	...	1 11
Demy... ...	25	...	33 6	...	30 6	...	2 0
Medium ...	35	...	48 6	...	43 0	...	2 9
Royal... ...	44	...	62 0	...	53 6	...	3 6
Super Royal	54	...	75 0	...	64 0	...	4 3
Imperial and Elephant	72	...	105 0	...	86 0	...	6 0

Drawing Cartridge, 1*s.* 9*d.* per lb.; Dr. Papers, 1*s.* 11*d.* per lb.; XX, 1*s.* 1*d.* and 1*s.* 4*d.* per lb.

C. ANSELL'S papers are about the same price as Whatman's up to Large Post and about 5 per cent. less above that size.

JOYNSON'S—First Quality about 14*d.*, Superfine 13*d.* per lb. Fine Quality about 11*d.*, Low Fine $8\frac{3}{4}d.$ per lb.

HOLLINGWORTH'S Fine about $9\frac{3}{4}d.$ per lb. Turkey Mill about $12\frac{1}{2}d.$ per lb.

E. TOWGOOD'S Superfine about 7*d.*, Fine 6*d.* per lb. Special about 5*d.* per lb.

Sizes of Printing Paper, subdivided.

	Broadside.	Folio.	4to.	8vo.	16mo.
Pot	15½ × 12½	12½ × 7¾	7¾ × 6¼	6¼ × 4	4 × 3
Foolscap	17 × 13½	13½ × 8½	8½ × 6¾	6¾ × 4¼	4¼ × 3½
Post	20 × 16	16 × 10	10 × 8	8 × 5	5 × 4
Crown	20 × 15	15 × 10	10 × 7½	7½ × 5	5 × 3¾
Demy	22½ × 17½	17½ × 11¼	11¼ × 8¾	8¾ × 5½	5½ × 4¼
Medium	24 × 19	19 × 12	12 × 9½	9½ × 6	6 × 4¾
Royal	25 × 20	20 × 12½	12½ × 10	10 × 6¼	6¼ × 5
Double Pot	25 × 15½	15½ × 12½	12½ × 7¾	7¾ × 6¼	6¼ × 4
Double Foolscap	27 × 17	17 × 13½	13½ × 8½	8½ × 6¾	6¾ × 4¾
Super Royal	27½ × 20½	20½ × 13¾	13¾ × 10¼	10¼ × 7	7 × 5
Double Crown	30 × 20	20 × 15	15 × 10	10 × 7½	7½ × 5
Imperial	30 × 22	22 × 15	15 × 11	11 × 7½	7½ × 5½
Double Post	32 × 20	20 × 16	16 × 10	10 × 8	8 × 5

The Paper Mills and Paper-making Machines of the World.

According to statistics published, the number of paper mills and paper-making machines in the world are distributed as follows:

	Mills.	Machines.
France	420	525
England	280	430
Scotland	68	98
Ireland	13	13
Belgium	30	41
Denmark	10	10
Germany	809	891
Spain	72	47
Portugal	16	7
Greece	1	1
Holland	61	40
Italy	228	158
Russia	133	137
Norway	8	8
Sweden	48	26
Roumania	3	3
India	6	4
Japan	6	6
Syria	1	—
Egypt	1	—
Mauritius	1	—
Australia	4	6
New Zealand	2	1
Canada	36	44
Mexico	11	12
Cuba	1	2
Argentine Republic	3	3
Brazil	5	4
Venezuela	1	1
U.S. America	884	1106
Austro-Hungary	220	273
Switzerland	35	67
Luxemburg	2	2
Total	3,419	3,966

Comparative Weights of Paper.—It is doubtful if the average printer would be able to give his customer the difference in his charge through another paper being substituted without having to resort to the use of pencil and paper. It is a desirable thing to be able to strike the difference off-hand, thereby saving the time of both the printer and the customer, and the following, which can be carried in the memory, should enable the printer to accomplish this:

Demy ($17\frac{1}{2} \times 22\frac{1}{2}$) to double crown ($20 \times 30$), add 50 per cent., or $\frac{1}{2}$ to the demy.

Double crown (20×30) to demy ($17\frac{1}{2} \times 22\frac{1}{2}$), deduct $33\frac{1}{3}$ per cent., or $\frac{1}{3}$ from double crown.

Demy ($17\frac{1}{2} \times 22\frac{1}{2}$) to royal ($20 \times 25$), add 25 per cent., or $\frac{1}{4}$ to the demy.

Royal (20×25) to demy ($17\frac{1}{2} \times 22\frac{1}{2}$), deduct 20 per cent., or $\frac{1}{5}$ from royal.

Royal (20×25) to double crown (20×30), add 20 per cent., or $\frac{1}{5}$ to the royal.

Double crown (20×30) to royal (20×25), deduct 16 per cent., or $\frac{1}{6}$ from double crown.

Sizes of Letter, Note Paper, etc.

	Inches.
Medium 4to	$10\frac{3}{4} \times 8\frac{3}{8}$
Medium 8vo	$8\frac{3}{8} \times 5\frac{3}{8}$
Demy 4to	$9\frac{3}{8} \times 7\frac{3}{8}$
Demy 8vo	$7\frac{1}{4} \times 4\frac{3}{4}$
Demy 16mo	$4\frac{5}{8} \times 3\frac{5}{8}$
Large Post 4to	10×8
Large Post 8vo	8×5
Post 4to	$9 \times 7\frac{3}{8}$
Post 8vo	$7\frac{1}{8} \times 4\frac{1}{2}$
Post 16mo	$4\frac{3}{8} \times 3\frac{5}{8}$
Copy 4to	$9\frac{5}{8} \times 7\frac{3}{4}$
Copy 8vo	$7\frac{1}{4} \times 4\frac{5}{8}$
Foolscap 4to	$8 \times 6\frac{3}{8}$
Albert	$6 \times 3\frac{7}{8}$
Queen	$5\frac{3}{8} \times 3\frac{1}{2}$
Prince of Wales	$4\frac{1}{2} \times 3$
Foolscap	$12\frac{3}{4} \times 8$

Sizes of Account Books.

Description.	Folio.				Quarto.				Octavo.			
	Broad.		Long.		Broad.		Long.		Broad.		Long.	
	Length.	Width.	Length.	Width.	Length.	Width.	Length.	Width.	Length.	Width.	Length.	Width.
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Foolscap	$12\frac{1}{2}$	8	$15\frac{1}{2}$	$6\frac{1}{4}$	$7\frac{1}{2}$	$6\frac{1}{4}$	$12\frac{1}{2}$	4	6	$3\frac{15}{16}$	$7\frac{1}{2}$	3
Demy ...	$14\frac{1}{4}$	$9\frac{1}{2}$	$18\frac{1}{2}$	$7\frac{3}{4}$	9	$7\frac{3}{4}$	$14\frac{1}{2}$	$4\frac{1}{2}$	7	$4\frac{1}{2}$	9	$3\frac{3}{8}$
Medium	$16\frac{1}{4}$	$10\frac{1}{4}$	$20\frac{1}{2}$	$8\frac{1}{4}$	$10\frac{1}{4}$	$8\frac{1}{4}$	$16\frac{1}{4}$	$5\frac{1}{8}$	8	5	$10\frac{1}{2}$	4
Royal ...	$18\frac{1}{2}$	$11\frac{1}{2}$	23	9	$11\frac{1}{2}$	9	$18\frac{1}{2}$	$5\frac{1}{2}$	9	$5\frac{1}{2}$	$11\frac{1}{2}$	$4\frac{3}{4}$
Sup. Roy.	$18\frac{1}{2}$	13	26	$9\frac{1}{4}$	13	$9\frac{1}{4}$	$18\frac{1}{2}$	$6\frac{1}{2}$	9	$6\frac{1}{2}$	13	$4\frac{1}{2}$
Imperial	$20\frac{1}{2}$	$14\frac{1}{2}$	29	$10\frac{1}{4}$	$14\frac{1}{2}$	$10\frac{1}{4}$	$20\frac{1}{2}$	$7\frac{1}{2}$	10	$7\frac{1}{4}$	$14\frac{1}{4}$	5

Sizes of Glazed Boards.

	Inches.
Foolscap	$17\frac{1}{2} \times 11\frac{1}{2}$
Demy	22×18
Royal	24×19
Royal Extra	$25\frac{1}{2} \times 20$
Double Foolscap	29×18
Super Royal	$29 \times 21\frac{1}{2}$
Imperial	31×23

Stock Sizes of Portfolios.

	Inches.		Inches.
Antiquarian ...	52×29	Half Royal ...	$19\frac{1}{2} \times 12\frac{1}{2}$
Double Elephant	39×27	Half Demy ...	18×11
Imperial	31×22	Music	16×11
Super Royal ...	26×20	Imperial 4to ...	$15 \times 10\frac{1}{2}$
Royal...	24×18	Half Crown ...	$15 \times 9\frac{1}{2}$
Half Imperial ...	21×15	Medium 4to ...	10×8
Crown	19×15		

Sizes of Envelopes.

	In Half.	In Three.
Queen	$3\frac{3}{4} \times 3$	... ...
Albert	$4\frac{1}{8} \times 3\frac{1}{4}$	... ...
Post	$4\frac{3}{4} \times 3\frac{3}{4}$	$4\frac{3}{4} \times 2\frac{3}{4}$
Large Post	$5\frac{1}{4} \times 4\frac{1}{4}$	$5\frac{1}{4} \times 3$
Demy	$5 \times 3\frac{7}{8}$	$5 \times 2\frac{3}{4}$
Medium	$5\frac{3}{4} \times 4\frac{1}{2}$	$5\frac{3}{4} \times 3$

Sizes of Tobacco and Tea Papers.

Tobacco.	*Tea.*
$\frac{1}{4}$ lb. Crown 4to.	1 lb. Foolscap.
2 oz. Crown 6to.	$\frac{1}{2}$ lb. Crown folio, or 14×11 in.
1 oz. Crown 9mo.	$\frac{1}{4}$ lb. Demy 4to.
$\frac{1}{2}$ oz. Crown 12mo.	2 oz. Demy 6to, or Crown 4to.
	1 oz. Demy 9mo.

Sizes of Sugar Papers.

	Inches.
Double Two Pound	24×16
Large ditto	27×17
Double Small Hand...	30×19
Royal Hand	25×20
Lumber Hand	$23\frac{1}{2} \times 18$
Middle Hand	$22\frac{1}{2} \times 16$
Purple Copy Loaf	$22\frac{1}{2} \times 16\frac{1}{2}$
Ditto Double ditto	$23 \times 16\frac{1}{2}$
Ditto Powder ditto	$26 \times 18\frac{1}{2}$
Ditto Single ditto	28×22
Ditto Elephant...	29×24
Purple Lump Loaf	33×23
Ditto Titler	35×20

Number of Cards contained in a Royal Board.

Thirds...	96	Double Small	25
Broad Thirds	80	Double Large	16
Small	50	Quad Small	12
Large	32	Quad Large	8

Cartridges and Grocers' Papers.

Description.	Inches.	Weights.
Elephant	31 × 22	56, 60
Imperial	30 × 22	60, 70, 80, 90
Cartridge size	26 × 21	38, 48, 58
Royal	25 × 20	20, 30, 40
Demy	$22\frac{1}{2} \times 17\frac{3}{4}$	20, 30
Double Crown	30 × 20	40, 50, 60
Ammunition	24 × 19	13
Double Lump	52 × 32	200
Titlers	35 × 29	120
Double Hambro' ...	30 × 27	—
Extra Large Lump ...	36 × 24	150
Single Lump	34 × 24	100
Large Single	29 × 23	—
Small Single	$27 \times 21\frac{1}{2}$	90
Elephant	29 × 24	90
Purple, No. 4	$28 \times 18\frac{1}{2}$	70
Purple, No. 3	26 × 17	56
Powder loaf	$26 \times 18\frac{1}{2}$	58
Single Hambro' ...	$24 \times 18\frac{1}{2}$	—
Large Double loaf ...	$23 \times 16\frac{1}{2}$	56
Small Double loaf ...	$21 \times 16\frac{1}{2}$	52
Royal hand	25 × 20	—
Lumber hand	$22\frac{1}{2} \times 18$	10, 13, 15, 19
Middle hand	22 × 16	12

Sizes of papers vary with different makes. The above may be taken as fairly correct, but it is always best when giving an order to state in inches the exact size required.

Average Thickness of 320 Pages Crown 8vo.

Antique Laid Printing Paper.

320 pp. Dble. Crown (20 × 30)	35 lb. =	$\frac{3}{4}$	to $\frac{7}{8}$	of an inch.
,, ,, ,,	40 ,, =	$\frac{7}{8}$	,, 1	inch.
,, ,, ,,	45 ,, =	1	,, $1\frac{1}{8}$	,,
,, ,, ,,	50 ,, =	$1\frac{1}{8}$	,, $1\frac{1}{4}$	,,
,, ,, ,,	55 ,, =	$1\frac{1}{4}$	,, $1\frac{3}{8}$	,,
,, ,, ,,	60 ,, =	$1\frac{3}{8}$	,, $1\frac{7}{16}$	,,

Antique laid printings vary considerably in bulk according to quality and surface.

Average Thickness of 500 Pages Crown 8vo Ordinary Rolled or Mill-surfaced Printing Paper (not Super-Calendered).

500 pp.	Double Crown	(20 × 30)	30 lb.	= $\frac{7}{8}$	of an inch.
„	„	„	35 „	= 1	inch.
„	„	„	40 „	= $1\frac{1}{8}$	„
„	„	„	45 „	= $1\frac{1}{4}$	„
„	„	„	50 „	= $1\frac{3}{8}$	„
„	„	„	60 „	= $1\frac{1}{2}$	„
„	„	„	70 „	= $1\frac{7}{8}$	„

All printing papers vary in thickness according to quality and surface.

Equivalent Weights of Printing Papers.

Demy. $22\frac{1}{2} \times 17\frac{3}{4}$	Double Foolscap. 27 × 17			Royal. 25 × 20			Double Crown. 30 × 20			Imperial. 30 × 22		
lb.	lb.	oz.	dwt.	lb.	oz.	dwt.	lb.	oz.	dwt.	lb.	oz.	dwt.
12	13	12	14	15	0	10	18	0	12	19	13	10
13	14	15	4	16	4	10	19	8	13	21	8	1
14	16	1	11	17	8	11	21	0	13	23	2	8
15	17	4	1	18	12	12	22	8	14	24	13	0
16	18	6	8	20	0	13	24	0	15	26	7	7
17	19	8	14	21	4	14	25	9	0	28	1	15
18	20	11	5	22	8	14	27	1	1	29	12	6
19	21	13	11	23	12	15	28	9	2	31	6	14
20	23	0	2	25	1	0	30	1	3	33	1	5
21	24	2	8	26	5	1	31	9	4	34	11	13
22	25	4	15	27	9	2	33	1	5	36	6	4
23	26	7	5	28	13	2	34	9	6	38	0	12
24	27	9	12	30	1	3	36	1	7	39	11	3
25	28	12	2	31	5	4	37	9	8	41	5	10
26	29	14	9	32	9	5	39	1	9	43	0	2
27	31	0	15	33	13	6	40	9	10	44	10	9
28	32	3	6	35	1	6	42	1	11	46	5	1
29	33	5	12	36	5	7	43	9	12	47	15	8
30	34	8	3	37	9	8	45	1	13	49	10	0

Number of Pages in a given Number of Quires.

1 Quire equal to		96 pages.		7 Quires equal to		672 pages.	
2 ,,	,,	192	,,	8 ,,	,,	768	,,
3 ,,	,,	288	,,	9 ,,	,,	864	,,
4 ,,	,,	384	,,	10 ,,	,,	960	,,
5 ,,	,,	480	,,	11 ,,	,,	1056	,,
6 ,,	,,	576	,,	12 ,,	,,	1152	,,

Parchment.—Five dozen skins = 60 is called a Roll.

Strawboards in a Bundle.

Number of Boards in a Half Hundredweight Bundle.

Thin, White Lined.

Size of Board.		4 oz.	6 oz.	8 oz.	10 oz.	12 oz.	14 oz.	16 oz.	18 oz.	20 oz.
22 × 32	... ...	181	133	104	84	72	62	54	48	42
20 × 30	... ...	181	133	104	84	72	62	54	48	42
25 × 30	... ...	181	133	104	84	72	62	54	48	42
20 × 30	Equal in	...	...	127	98	84	72	63	...	...
25 × 30	thickness	...	...	101	82	70	61	52	...	...
24 × 38	to a	...	...	78	66	54	50	42	...	...
27 × 34	22 × 32	...	...	82	66	54	48	42	...	...
28 × 36	Board.	...	...	...	57	50	42	38	...	...

Thin, Unlined.

$3\frac{1}{2}$ oz.	......	256	Boards.
4 ,,	......	224	,,
6 ,,	......	150	,,
8 ,,	......	112	,,
10 ,,	......	90	,,
12 ,,	......	75	,,
14 ,,	......	64	,,
16 ,,	......	56	,,
18 ,,	......	50	,,
19 ,,	......	48	,,
20 ,,	......	45	,,

Thick, Unlined.

$1\frac{1}{2}$ lb.	....	37	Boards.
$1\frac{3}{4}$,,	....	32	,,
2 ,,	....	28	,,
$2\frac{1}{4}$,,	....	24	,,
$2\frac{1}{2}$,,	....	22	,,
$2\frac{3}{4}$,,	....	20	,,
3 ,,	....	18	,,
$3\frac{1}{2}$,,	....	16	,,
4 ,,	....	14	,,

EQUIVALENT WEIGHTS PER REAM OF WRITING PAPER OF VARIOUS SIZES.

Foolscap, $16\frac{3}{4} \times 13\frac{1}{4}$.		Pinched Post, $18\frac{1}{2} \times 14\frac{3}{4}$.		Post, $19 \times 15\frac{1}{4}$.		Large Post, $21 \times 16\frac{1}{2}$.		Extra Large Post, $22\frac{1}{2} \times 17\frac{3}{4}$.		Royal, $24 \times 19\frac{1}{4}$.		Super Royal, $27 \times 19\frac{1}{4}$.		Imperial, 30×22.	
lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
7	11	9	7	10	1	12	0	13	14	16	0	18	0	22	14
8	5	10	4	10	14	13	0	15	0	17	6	19	8	24	13
9	0	11	1	11	12	14	0	16	3	18	11	21	5	26	11
9	10	11	13	12	9	15	0	17	5	20	0	22	10	28	10
10	4	12	10	13	6	16	0	18	8	21	6	24	1	30	8
10	14	13	6	14	4	17	0	19	10	22	11	25	9	32	7
11	9	14	3	15	1	18	0	20	13	24	0	27	1	34	5
12	3	15	0	15	15	19	0	21	15	25	6	28	9	36	4
12	13	15	12	16	12	20	0	23	2	26	11	30	1	38	2
13	7	16	9	17	9	21	0	24	4	28	0	31	9	40	1
14	2	17	6	18	7	22	0	25	7	29	6	33	1	41	15
14	12	18	2	19	4	23	0	26	9	30	11	34	9	43	14
15	6	18	15	20	2	24	0	27	12	32	1	36	1	45	12
16	0	19	11	20	15	25	0	28	14	33	6	37	9	47	11
16	11	20	8	21	12	26	0	30	1	34	11	39	1	49	9
17	5	21	5	22	10	27	0	31	3	36	1	40	9	51	8
17	15	22	1	23	7	28	0	32	6	37	6	42	1	53	6
18	9	22	14	24	5	29	0	33	8	38	11	43	9	55	5
19	4	23	11	25	2	30	0	34	11	40	1	45	1	57	3
19	14	24	7	26	0	31	0	35	13	41	6	46	9	59	2
20	8	25	4	26	13	32	0	37	0	42	11	48	1	61	0
21	3	26	0	27	10	33	0	38	2	44	1	49	9	62	15
21	13	26	13	28	8	34	0	39	5	45	6	51	1	64	13
22	7	27	10	29	5	35	0	40	7	46	12	52	9	66	12
23	1	28	6	30	3	36	0	41	10	48	1	54	1	68	11
23	12	29	3	31	0	37	0	42	12	49	6	55	10	70	9
24	6	30	0	31	13	38	0	43	15	50	12	57	2	72	8
25	0	30	12	32	11	39	0	45	1	52	1	58	10	74	6
25	10	31	9	33	8	40	0	47	4	53	6	60	2	76	5

RELATIVE WEIGHTS OF A REAM CONTAINING 480, 500, OR 516 SHEETS.

Ream of 480 Sheets.	Ream of 500 Sheets.		Ream of 516 Sheets.		Ream of 480 Sheets.	Ream of 500 Sheets.		Ream of 516 Sheets.	
lb.	lb.	oz.	lb.	oz.	lb.	lb.	oz.	lb.	oz.
7	7	4	7	8	39	40	10	41	15
8	8	5	8	9	40	41	10	43	0
9	9	6	9	10	41	42	11	44	1
10	10	6	10	12	42	43	12	45	2
11	11	7	11	13	43	44	12	46	3
12	12	8	12	14	44	45	13	47	5
13	13	8	13	15	45	46	14	48	6
14	14	9	15	1	46	47	14	49	7
15	15	10	16	2	47	48	15	50	8
16	16	10	17	3	48	50	0	51	9
17	17	11	18	4	49	51	0	52	11
18	18	12	19	5	50	52	1	53	12
19	19	12	20	7	51	53	2	54	13
20	20	13	21	8	52	54	2	55	14
21	21	14	22	9	53	55	3	56	15
22	22	14	23	10	54	56	4	58	1
23	23	15	24	11	55	57	4	59	2
24	25	0	25	12	56	58	5	60	3
25	26	0	26	14	57	59	6	61	4
26	27	1	27	15	58	60	6	62	5
27	28	2	29	0	59	61	7	63	7
28	29	2	30	1	60	62	8	64	8
29	30	3	31	3	61	63	8	65	9
30	31	4	32	4	62	64	9	66	10
31	32	4	33	5	63	65	10	67	11
32	33	5	34	6	64	66	10	68	13
33	34	6	35	7	65	67	11	69	14
34	35	6	36	8	66	68	12	70	15
35	36	7	37	10	67	69	12	72	0
36	37	8	38	11	68	70	13	73	1
37	38	8	39	12	69	71	14	74	3
38	39	9	40	13	70	72	14	75	4

QUANTITY OF PAPER REQUIRED ACCORDING TO NUMBER OF PAGES IN BOOK.

Pages.	Sheets.	Reams per 1,000 copies.	Pages.	Sheets.	Reams per 1,000 copies.
4	$\frac{1}{8}$	$\frac{1}{4}$	192	6	12
8	$\frac{1}{4}$	$\frac{1}{2}$	224	7	14
12	$\frac{3}{8}$	$\frac{3}{4}$	256	8	16
16	$\frac{1}{2}$	1	288	9	18
20	$\frac{5}{8}$	$1\frac{1}{4}$	320	10	20
24	$\frac{3}{4}$	$1\frac{1}{2}$	352	11	22
28	$\frac{7}{8}$	$1\frac{3}{4}$	384	12	24
32	1	2	416	13	26
64	2	4	448	14	28
96	3	6	480	15	30
128	4	8	512	16	32
160	5	10			

The above calculations are based on reams of 500 sheets, double crown, 32 pages on sheet. "Printers'," or "Perfect," reams (516 sheets) should give overs of say 5 to 10 per thousand, according to number printed and class of work.

SIZES OF MILLBOARDS.

	Mark.	Size in Inches.
Small Pot	SP	$16 \times 13\frac{1}{2}$
Pot	P	$17\frac{1}{4} \times 14\frac{1}{4}$
Foolscap	FC	$18\frac{1}{2} \times 14\frac{1}{2}$
Crown	C	$20 \times 16\frac{1}{4}$
Small Half Royal	SHR	$20\frac{1}{4} \times 13$
Large Half Royal	LHR	21×14
Short	S	21×17
Short Short	SS	$20 \times 17\frac{1}{2}$
Half Imperial	HI	$23\frac{1}{2} \times 16\frac{1}{2}$
Small Half Imperial	SHI	$22\frac{1}{4} \times 15$
Narrow Middle	NM	$22 \times 17\frac{1}{2}$
Middle or Small Demy	M	$22\frac{1}{2} \times 18\frac{1}{2}$
Large Middle or Large Demy	LM	$23\frac{1}{4} \times 18\frac{1}{2}$
Large or Medium	L	24×19
Small Royal	SR	$25\frac{1}{2} \times 19\frac{1}{2}$

	Mark.	Size in Inches.
Large Royal	R	$26\frac{3}{4} \times 20\frac{3}{4}$
Extra Royal	Ex. R	$28\frac{1}{2} \times 21\frac{1}{2}$
Whole Imperial	I	$32 \times 22\frac{1}{2}$
Long Thin	LT	30×21
Atlas	A	30×26
Extra Atlas	EA	$32\frac{1}{4} \times 26\frac{1}{2}$
Long Royal	LR	34×21
Colombier	Col.	36×24
Portfolio	PF	34×27
Double Elephant	DE	40×28
Emperor	E	44×30
Double Royal	DR	46×21
Long Colombier	LC	49×24
Long Double Elephant ...	LDE	$50 \times 27\frac{1}{2}$
Antiquarian	Ant.	54×30
Extra Antiquarian	Ex. Ant.	$54 \times 34\frac{1}{2}$

Sizes of French Printing Papers with English Equivalents.

	Inches.		Centimètres.
Pot	12·2 × 16·5	...	31 × 42
Poulet	8·6 × 11·0	...	22·5 × 28
Couronne	14·2 × 18·1	...	36 × 46
Ecu	15·7 × 20·4	...	40 × 52
Coquille	17·7 × 22·0	...	45 × 56
Cloche-Normande	13·8 × 20·4	...	35 × 52
Tellière	13·0 × 17·3	...	33 × 44
Griffon	13·8 × 17·7	...	35 × 45
Petit Raisin	12·6 × 17·0	...	32 × 43
Carré	17·7 × 22·0	...	45 × 56
Cavalier	18·5 × 23·6	...	47 × 60
Raisin, *or* Grand Raisin ...	19·7 × 25·6	...	50 × 65
Petit Jésus	21·6 × 27·5	...	55 × 70
Jésus-Musique	22·0 × 27·5	...	54 × 70
Grand Jésus	22·4 × 29·5	...	56 × 75
Petit Colombier, *or* Soleil ...	23·6 × 31·5	...	60 × 80
Grand Colombier	24·4 × 35·4	...	62 × 90
Grand Aigle	28·8 × 40·0	...	73 × 102
Grand Monde	35·4 × 47·1	...	90 × 12

Sizes of German Papers with French Equivalents.

Writing Paper.

	Inches.		Centimètres.
Schlängle	12·2 × 15·3	...	31 × 39·5
Canzlei...	12·9 × 16·5	...	33 × 42
„ (Untrimmed) ...	13·10 × 16·9	...	34 × 43
Propatria	14·1 × 17·3	...	36 × 44·5
Löwen	14·3 × 19·2	...	37 × 48

Paper for Account Books and for Drawings.

	Inches.		Centimètres.
Klein Median	15·6 × 20	...	40 × 51
Median...	16·5 × 21·5	...	42 × 54
Gross Median	17·3 × 23·2	...	44 × 58
Klein Royal...	19·2 × 24·8	...	48 × 63
Noten Royal (for Music) ...	19·9 × 26·3	...	50 × 67
Gross Royal...	20·7 × 27·1	...	52 × 68
Super Royal	21·5 × 28·2	...	54 × 72
Imperial	22·8 × 29·8	...	58 × 76
Klein Adler...	24·4 × 35·5	...	62 × 90
Elephant	26·3 × 36·3	...	67 × 92

Sizes of Italian Papers with French Equivalents.

	Inches.		Centimètres.
Ottavina	5·3 × 8·5	...	13·5 × 21
Sestina	7·1 × 9·0	...	18 × 22·5
Quartina	8·3 × 10·6	...	21 × 27
Mezzanella	9·0 × 14·2	...	23 × 36
Olandina	9·8 × 15·3	...	25 × 39
Quadrotta (formato francesé)	10·4 × 16·5	...	26·5 × 42
„ (formato Italiano)	10·6 × 17·4	...	27·5 × 44·5
„ (formato tedesco)	11·4 × 18·9	...	29 × 48
Processo, *or* Notarile	10·2 × 15·0	...	26 × 38
Protocollo, *or* Pellegrina ...	12·2 × 16·5	...	31 × 42
Rispetto...	13·0 × 17·7	...	33 × 45
Stato, *or* Leona	14·1 × 18·9	...	36 × 48
Bastarda	16·5 × 22·1	...	42 × 56

	Inches.	Centimètres.
Realino, *or* Mezzana	17·7 × 23·6 ...	45 × 60
Reale	19·7 × 25·5 ...	50 × 65
Realone	20·4 × 27·1 ...	52 × 69
Imperialino	21·2 × 29·9 ...	54 × 76
Imperiale	24·0 × 32·0 ...	61 × 81
Elefante	26·0 × 37·8 ...	66 × 96
Aquila	27·5 × 39·4 ...	70 × 100

Table for Giving Out Paper.

Number of Copies.	Number of Impressions on Sheet.															
	1		2		4			8			12			16		
	q.	s.	q.	s.	q.	s.	o.	q.	s.	o.	q.	s.	o.	q.	s.	o.
50	2	2	1	1	0	13	2	0	7	6	0	5	10	0	4	14
100	4	4	2	2	1	1	0	0	13	4	0	9	8	0	7	12
150	6	6	3	3	1	14	2	0	19	2	0	13	6	0	10	10
200	8	8	4	4	2	2	0	1	1	0	0	17	4	0	13	8
250	10	10	5	5	2	15	2	1	8	6	0	21	2	0	16	6
300	12	12	6	6	3	3	0	1	14	4	1	1	0	0	19	4
400	16	16	8	8	4	4	0	2	2	0	1	10	8	1	1	0
500	20	20	10	10	5	5	0	2	15	4	1	18	4	1	8	12
750	31	6	15	15	7	20	2	3	22	2	2	15	6	1	23	2
1000	41	16	20	20	10	10	0	5	5	0	3	12	8	2	15	8
1500	62	12	31	6	15	15	0	7	20	4	5	5	0	3	22	4
2000	83	8	41	16	20	20	0	10	10	0	6	23	4	5	5	0
3000	125	0	62	12	31	6	0	15	15	0	10	10	0	7	20	8
4000	166	16	83	8	41	16	0	20	20	0	13	22	8	10	10	0
5000	208	8	104	4	52	2	0	26	1	0	17	9	4	13	1	8

NOTE.—q *means quires,* s *sheets, and* o *the overplus copies.*

Other numbers may be obtained by multiplying any of the above quantities.

TABLE SHOWING COST OF PAPER PER 100.

Price per Ream.	5/-		6/-		7/-		8/-		9/-		10/-		11/-	
Sizes.	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
16mo	0	0¾	0	1	0	1¼	0	1¼	0	1½	0	1¾	0	1¾
12mo	0	1¼	0	1¼	0	1½	0	1¾	0	2	0	2¼	0	2½
8vo	0	1¾	0	2	0	2¼	0	2½	0	3	0	3¼	0	3½
4to	0	3½	0	4	0	4½	0	5¼	0	6	0	6½	0	7¼
Third	0	4½	0	5¼	0	6	0	7	0	8	0	8¾	0	9½
Half-sheet ...	0	7¼	0	8	0	9	0	10½	0	11¾	1	1	1	2¼
Sheet	1	1	1	3½	1	6	1	9	1	11¼	2	2	2	4½

Price per Ream.	12/-		13/-		14/-		15/-		16/-		17/-		18/-	
Sizes.	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
16mo	0	2	0	2	0	2¼	0	2½	0	2¾	0	2¾	0	3
12mo	0	2¾	0	2¾	0	3	0	3¼	0	3½	0	3¾	0	4
8vo	0	4	0	4¼	0	4½	0	5	0	5¼	0	5½	0	6
4to	0	7¾	0	8½	0	9	0	9¾	0	10½	0	11	0	11¾
Third	0	10½	0	11¼	1	0¼	1	1	1	2	1	2¾	1	3¾
Half-sheet ...	1	3½	1	5	1	6¼	1	7½	1	9	1	10	1	11½
Sheet	2	7¼	2	10	3	0½	3	3	3	5½	3	8	3	11

THE WAREHOUSE.—The warehouse is generally supposed to be non-productive—a department upon which the less bestowed in labour and space the better. When the cost of a job is estimated, it is seldom that the expense of counting, drying, pressing, and packing up is taken into consideration. Composition, paper, and print are the items which are calculated. As is well known, the expense of warehousing is a considerable addition to the total cost, especially when the whole is done in a proper manner. The warehouse, or that portion of the printing-office used in the clearing and packing-up of work, must be both light and dry. Counters should be erected in the lightest positions for this purpose. Above all things, cleanliness should be insisted upon. Clean work is deposited in all directions, and if dirt or dust is allowed to accumulate, many sheets will be spoiled, and, in the case of short numbers, will

possibly render the delivery deficient of the proper amount. Although a small matter in itself, the warehouseman should write a good hand. The neat labelling of work is characteristic of careful packing, and the clearness and precision of delivery-notes favourably impress a customer. Printed labels should always be pasted on parcels. Although badly-printed work can never be made to look well by any amount of drying, pressing, or rolling, the finest machine-work may be speedily spoiled by carelessness on the part of the warehouseman. Much spoilage is caused by set-off while printing, and work is also spoiled by the same cause even after it has left the machine-room. This is owing to various causes, one perhaps being the pressing of the sheets before they have been properly dried. Work on highly-glazed paper must be so stored after leaving the machine as to prevent any undue pressure.

THE WAREHOUSEMAN.—The warehouse business of a printer is a highly important part of his concern, the bad management of which not only injures his own credit, but also materially affects the interest of his employers; it is, therefore, necessary to appoint such a man for the management of it who has been regularly brought up to the business, and on whom the utmost reliance may be placed for honesty, sobriety, and integrity. Some printers, with a view to saving a few shillings per week, take into their service lads or men perfectly unacquainted with the business of the warehouse, who, through ignorance and carelessness, fall into many serious mistakes, such as mixing paper of the same size belonging to different persons, and thereby destroying the uniformity of the work; giving or setting out the paper incorrectly, which must afterwards be made good by reprinting those sheets which are found to be deficient. Many other circumstances might be stated to show the disadvantage of employing persons in the warehouse not acquainted with its business. It is necessary that the master or overseer should frequently look to the concerns of the warehouse, that the people employed there may get forward the different works with neatness and accuracy. When the porter or carman brings paper, the warehouseman should demand the bill of delivery, order

the paper to be brought in, and see if it is right according to the bill, and enter it immediately in the warehouse book.

THE EFFECT OF STORAGE ON PAPER.—Many papers actually deteriorate if warehoused for a long period, whilst others as certainly improve if stocked for a time.

Papers Improved by Warehousing.—The quality of paper for envelopes, lithographic papers, and printing papers, is improved by warehousing. The first have a tendency to wrinkle at the edges, which causes much annoyance during cutting and in the gumming machine. This defect arises from the moisture of the air failing to penetrate readily the interior of the piles, which naturally remains almost dry while the edges are moist. But when the paper has been warehoused for a long time, this is equalized throughout the mass, and the sheets cut for the envelopes are absolutely flat. All papers stretch under the action of humidity, and in two directions; but more particularly in the direction in which the paper is drawn through the machine. When, therefore, a paper is pressed on the stone without being previously prepared, it happens that, during the intervals between the different impressions, the paper swells in size, and the various colours do not register. Wavy edges often produce folds when the paper passes through the press. The edges, waved through the same causes which were noted in regard to envelopes, are due entirely to the absorption of moisture, and this defect disappears with warehousing.

Papers Damaged by Warehousing.—But other papers suffer from warehousing. Fine satin papers rapidly lose their satin finish. This latter arises from the water being forced quickly from the paste on the cloth of the table on which paper is made, this being the sort where the numerous fibres lie straight and are not felted horizontally. The calendars flatten these fibres on themselves; but under the influence of moisture, they regain their original form and destroy the satin effect. Coloured papers, with the invariable exception of those coloured with cobalt blue, are influenced by warehousing. The colours are rapidly decomposed by heat and light, and for this reason these papers

should be kept in a cool and dark place. Mechanical wood papers lose their strength, becoming brittle and changing colour under the influence of humidity, which acts on the resinous acids which they contain. The same is true of papers containing traces of free acids or chlorine. Papers united with resin also undergo a discoloration more or less pronounced.

THE ORDERLY ARRANGEMENT OF STOCK.—Even in the busiest times stock should not be neglected. It may look as though the printer had been exceedingly busy if his stock looks disorderly, but in most cases such disorder will be likely to make a bad impression on a new customer. There is an old saying that to be successful you must look successful. That saying may also be applied to the looks of the warehouse. If the warehouse gives outward evidence of orderly management, the self-confident air of its manager will inspire others the sooner with a belief in his ability and his success. The man who is habitually orderly will show it in everything belonging to him—in his every step, movement, and look. It is to pick out the failures. They are always looking for the thing they know they have but cannot find, owing to lack of system and order, and inability to insist upon tidiness in others. They are bound to wear out the good nature and patience of even the most indulgent employers, and sooner or later customers will be forced to patronize houses where more prompt and better service is given. Orderliness carries with it positiveness, and the positive man, other things being equal, is bound to be a success, while the negative man is apt to lack confidence in himself and to become shiftless. To be successful it is imperative that a man cultivate order in his business, be clean inside and out, and concentrate his faculties and good qualities.

TO WET DOWN PAPER.—Place a wetting-board near the trough; on it lay half a dozen dry sheets of the paper to be wetted. Then take half a dozen other sheets and pass them together through the water; then lay half a dozen sheets of dry paper on these, and go on in the same manner until it is finished. If the paper was delivered folded, it

must be opened out, and care must be taken to turn the backs or ridges sometimes up and sometimes down, in order that it may eventually come out flat. When the wetting process is finished, put a board on the top of the heap, and place weights on it—a small weight at first—say twenty pounds, and after an hour increase it to sixty, and then put on as much pressure as you like. Leave the heap for twelve hours. If it opens out too wet, intersperse some dry sheets throughout the heap, and squeeze it for some time in a screw or hydraulic press; if too dry, sprinkle every dozen or twenty sheets and press as before.

THE WETTING OF PAPERS.—With regard to papers which are wetted previous to working, their nature must be taken into account. Some are rather hard and harsh, while others are softer, each requiring special treatment from the wetter. The character of the work to be printed must also be considered. If the formes are heavy and the paper hard, more water is requisite; but light and open formes do not need so much. Softish papers are found to wet more evenly in quires alternately. Great care is necessary with all thin papers, the wetting of these being always attended with difficulty. Very thick papers absorb the water freely, and must be well turned, and allowed to stand longer than thin papers. It is often found that certain makes cockle or pucker up when damped. This is troublesome, causing extra labour in wetting, and loss of time in working. They should be dipped in small quantities, and afterwards well turned and pressed. No second damping is of use, this only making matters worse.

A WRINKLE IN DAMPING DOWN PAPER.—A French suggestion is that a little glycerine mixed in the water when damping the paper gives it a soft and velvety surface very favourable to the printing of illustrated work. The proportion is one part of glycerine to two hundred of water.

WET OR DRY PAPER?—The making-ready for dry paper will take more time than that for wet; the types will sooner be worn out, and when not quite or, at least, nearly new,

fine printing on dry paper cannot be achieved. Types and illustrations will always appear cleaner and quieter on wetted paper, and shallow cuts may be conveniently printed on it, when it is impossible to print them on dry paper. Differences in inking will show immediately on dry paper, and if its quality be not equal, the thinner sheets and those the surface of which is not quite smooth will look as if the making-ready had not been perfected. Dry paper does not take all the ink off the forme, which, to keep the printing clean, must be washed oftener; but, on the other hand, it is easier to keep good register with dry paper, as the sheets do not shrink, and the grippers hold them tighter and more evenly. Papers do not always form a perfectly homogeneous mass; small particles will separate when printed on without previous wetting; and they will remain on the forme and show off as black spots on the next printed sheets. This will be less the case with wetted paper. Paper, when wetted before printing, does not require as much ink as dry calendered paper. Shortly, if bookwork is to be printed dry, the paper must be smooth and even, the type new, the ink of good quality, and sufficient time must be left for a perfect making-ready, but the wear and tear of the types and machine will always be great; open woodcuts requiring but little ink may also be printed on dry paper when it is well calendered and of a smooth and soft quality; but full cuts, to which a large supply of ink must be given, will never show perfectly well on dry paper.

Rapid Drying of Printed Work.—It is frequently important that circulars should be sent out immediately after having been printed. This may at times be effected by using a well-glazed printing paper instead of writing paper. The former will absorb the ink so fast that, unless piled up more than is customary, it may be folded and cut at once. Common qualities of writing paper have a strong tendency to absorb ink; but the hard, highly glazed papers absorb ink so very slowly that weeks may elapse before it becomes dry. It is thus evident that, to secure fast drying, the printing must be done with as little ink as will suffice to do the job properly, or something else must be done to obviate a set-off. One way to accomplish this is to dust the

freshly-printed sheets with some fine powder which will not soil the paper, but will stick to the ink. For the paper a white powder is the best, so long as it is not used in sufficient quantity to obscure the ink. Powdered French chalk is in favour for this purpose, but it causes the paper to slip about during the process of folding and cutting, besides making it slippery. Another drawback is that this chalk being of unequal granulation, the coarsest particles are left to the last, and become plainly visible. Calcined magnesia has none of these disadvantages. It costs more in the first place than French chalk, but on account of its light weight it is cheaper in the end. It does not render the paper slippery, is of uniform fineness, leaving no coarse particles as a residuum. It has, however, a tendency to stick together and remain among the sheets, but this can be prevented with care. In using either of these or any other powders, do not dust them on the top of the printed heap, as that will increase the setting-off. It is best to lay out a quantity of the powder in a convenient place, then take a pad of cotton or wool, or a piece of loose cotton cloth, and dust the powder into that for a beginning; then take the printed sheet from the pile, lay it down in a clean place, and rub the powder over the ink, taking care to leave no superfluous quantities, pass it on as one of a new heap, and so continue the operation. Powder must be renewed on the pad or cloth about every other sheet, this varying with the size of the job. It is important not to use too much powder, or the over-dusted sheets will have to be handled over again to remove the superfluity.

Keeping Paper Dry.—A method of keeping paper free from moisture, as is essential for three-colour and duplex half-tone printing, has been patented, but it may be pointed out that even if new to the printing trade, it has been long practised by photographers for hastening the drying or preserving the dryness of paper. It consists in having an airtight cupboard, in the bottom of which is placed chloride of calcium, or other chemicals which absorb the moisture of the air. The sheets are put into the cabinet in trays which have plenty of space for air to circulate round them, and the doors of the cabinet are made large enough to be

thrown open wide so that the trays can be removed and replaced quickly, thus preventing the dry air of the cabinet from being entirely replaced by a moist atmosphere.

Printing Papers with Watermarks.—Makers of good and high-class writings, both machine and handmade, have been in the habit ever since paper was manufactured of watermarking them with a device, initials, or name in full. The result is that while in their own interests makers have been compelled to keep up the qualities, the consumer feels sure of getting a first-class article. In printing papers, on the contrary, it is very seldom indeed that we find a watermark of any kind, and the consumer hardly knows what he is buying. There is really no sufficient reason why well-known and reliable makes of printing paper should not be systematically watermarked. The one objection is that the watermark would often appear out of the centre, and in some cases perhaps divided in the middle. This, however, is of no practical importance.

A New Process for Watermarking Paper consists in transferring to the dandy roll a design in relief, previously executed on a sheet of paper with a small tube-pen containing a specially prepared enamel. The design, as drawn, is placed on the roll or mould and after some hours the paper is removed by damping, leaving the enamel design fixed on the wire-cloth. With the tube-pen the lines in relief are then added, imitating the wire-mark, and covered with varnish, producing a filigrane. When done with, this watermark can be removed without damaging the roll or mould, and a fresh design applied, and in case of accident it can be easily repaired.

Watermarks on Paper.—The oldest paper as yet discovered with a mark is the account book of 1301, supposed to be manufactured by the Holbein family at Ravensburg. All other paper manufactured by the Holbeins bears the Bull's Head, whereas this account book is marked with the "Globe and Cross." The Globe and Jug are the most ancient marks as yet discovered; and these, together with the "Post horn," which appeared in 1376, became, by the

end of the fourteenth century, the principal marks on paper manufactured in the Low Countries, whence they spread during the ensuing hundred years to Gouda and Delft. Paper, as a rule, without any characteristic sign is the oldest; since the watermark signifies a certain progress in the art of paper making. Caxton seems to have used paper chiefly obtained in the Low Countries, and in addition to the Bull's Head and the P and Y, there will also be found the Open Hand, worked on the paper on which the "Golden Legend" was printed in 1483, and also the Unicorn. Other paper employed by this famous printer came from Germany, since in his "Recueil of the Histories of Troy" (1468) there appears the bunch of grapes, which was a German mark. In the "Game of Chesse," the paper bears evidence of Italian origin, as there is a mark of an anchor enclosed by a circle. The Dolphin and Anchòr was a very famous mark, and, after the Bull's Head, perhaps the best known, the reason being that this device was extensively used by Aldus Manutius who has thus perpetuated to our day the ancient symbol of the city of Venice.

Cheap Way of Watermarking Paper.—The method used places the watermark in the paper by a much simpler process than formerly. Instead of weaving the mark in the wire of the dandy roll, a slow, laborious process, the new way is to pass the wet paper between a press roll, covered with stereotype plates, and the drier cylinder, the paper thus receiving a watermark which suffices for all practical purposes. The process is now being used in watermarking an immense contract for a wholesale house of national reputation, which is using the paper for wrappers, their name appearing every ten inches apart on the sheet. It may be predicted for this process that it will to a certain extent take the place of printing. The contract spoken of above will keep one paper machine at work eight months of each year to supply the demand. When they first tried these stereotype plates a hardwood press roll was used to which they were attached by screws. This caused vexatious delays by the plates working loose. They now have a solid brass press roll made, in the surface of which are 3,500 screw holes where the plates are fastened.

CRYSTALLINE COATING FOR PAPER.—This may be obtained, it is stated, by mixing a very concentrated cold solution of salt with dextrine and laying the thinnest coating of the fluid on the surface to be covered by means of a broad, soft brush. After drying, the surface has a beautiful, bright, mother-of-pearl coating, which, in consequence of the dextrine, adheres firmly to paper and wood. The coating may be made adhesive to glass by doing it over with an alcoholic shellac solution. Sulphate of magnesia, acetate of soda, and sulphate of tin are among the salts which produce the most attractive crystalline coatings. Paper must first be sized, otherwise it will absorb the liquid and prevent the formation of crystals.

BLOTTING PAPER FOR DUPLICATING COPIES.—This is a wrinkle by which the old 'graph processes are superseded in a cleanly and efficient manner. Four parts of glue are soaked in five of water and in three of ammonia liquor until the glue is softened. The glue is then warmed until dissolved and three parts of granulated sugar and eight of glycerine are added, the whole being stirred and brought to boiling point. While hot the mixture is painted with a broad brush on thick blotting paper until thoroughly soaked and a thin coating remains on the surface. After a day or two's drying it is ready for use. The writing to be copied is written with aniline ink on ordinary writing paper. Before transferring, the blotting paper is damped with a sponge or brush and allowed to stand for two or three minutes. The writing paper—writing downwards—is placed on the blotting and the air bubbles pressed out. After half-a-minute's pressure the writing paper is removed. The copies are made in the ordinary 'graph manner from the blotting paper and when the impressions grow faint the surface of the blotting is again damped.

DETECTING ARSENIC IN PAPERS.—Impregnate the paper with a solution of nitre, dry, and burn it on a plate; the ashes are boiled with dilute caustic potash, the liquor filtered, and sulphuric acid and permanganate solution added, until no more is decolorized; finally, the cold filtered liquid is treated in a flask with zinc and sulphuric acid, two

papers being placed on the neck, one being impregnated with lead acetate, the other with silver nitrate; unless sulphuretted hydrogen be formed, the first is not blackened, whilst the second is blackened if arseniuretted hydrogen be evolved, *i.e.*, if arsenic be present in the paper.

RETREE.—The origin of this word "retree" is not to be traced farther back than the reign of the great Napoleon, prior to the Peninsular War. He desired that the soldiers in every regiment should be of uniform height, and also of uniform physical formation, so that each man should appear equal to his fellow in the proportions of manhood. The words *trier de soldats* were thus first used, which meant "Pick of the soldiers." A subordinate officer first arranged those in line who, according to his judgement, were of equal height and physical proportions. Next, the colonel of the regiment inspected and further picked out those unsuitable for the crack regiments. Then Napoleon himself would pass down the lines, and further weed out those he considered not quite up to the mark. The weeded men were called *retrié*, but the French pronunciation allows of the Anglicized *retree*, as we now spell the word; the absolute meaning being "thrice picked." The English word *retree* is now well known and acknowledged in the trade. Fine papers are turned over sheet by sheet, and the finest qualities are divided into three parcels, only clean perfect sheets being passed for good paper. Those sheets which contain spots, or are otherwise imperfectly made, are separated from the well-authenticated sheets or the broken make, and are called *retree*, sometimes indicated by two crosses, thus × ×.

DESIGNATIONS FOR PAPER.—A writer strongly condemns the crude method still employed by the manufacturer to designate the grade and quality of papers. "To begin with, we have not yet got the ream to the point where it invariably stands for five hundred sheets. Manilas and news are still manufactured and sold on the old four hundred and eighty basis. Then, again, papers that are in the same class come in various sizes, as is the case with writing papers and ledger papers. This in turn creates another

difficulty in the necessity of one learning the distinguishing weights and their equivalents in the varying thicknesses of the several sizes and weights of paper stock. Some firms have already realized this fault and have adopted the plan of denoting the various 'weights' or thickness of their paper stock by numbering. If this could be extended it would be very helpful. Coated paper, say thickness number 10, would then be no different in bulk from bond paper of number 10 thickness; and so on through the list. This would not do away with the necessity for knowing the weight per ream of five hundred sheets, but a customer usually knows what he wants in thickness rather than in weight."

Waterproof Luminous Paper.—That which will shine in the dark is made as follows: 40 parts paper stock (pulp), 10 parts phosphorescent powder, 10 parts water, 1 part gelatine, and 1 part bichromate of potash.

To Cut Paper into Three or Five.—Most printers have often been vexed in trying to cut paper into three or five equal parts. Simply roll the paper into a scroll until the end meets twice, then mark the junction point with finger-nail or pencil, and the sheet will be divided into three parts. If one-fifth is desired, roll the paper four times.

Cheap Stationery and Printing.—Notwithstanding the keenness of competition, as time advances there is a growing tendency among consumers to patronize and use better class goods in this important department, instead of the so-called cheap and nasty. Nothing is cheap which is not thoroughly good, and in most instances good quality does not come into the category of cheapness. Good stationery is as necessary to a commercial house as good dress is essential to business men. Cheap stationery impresses no one, and gives the purchaser little or no benefit. Take any great advertising firm in London as a test. Do they issue common, flimsy, ill-printed bills at a shilling a thousand? Do they send out circulars almost unreadable, and which fall to pieces the moment they are touched? On the contrary, such a firm seeks out the best designs which money can

buy, and results show that by such action they increase their trade, and keep up a style and quality which is at once recognized, supported, and respected. Experience teaches practical business men that so-called cheap stationery is not cheap.

New Cutting Machine.—A new paper-cutting machine has been patented that is so arranged as to do away with "cutting sticks." This machine has a flat-edge lower blade placed in the table bed. The upper knife on descending makes a shear cut; the knife passes below the table bed and throws part of the front table out as the knife ascends; the front table is thrown back automatically, thus making a solid surface of the table. The set-screws generally used to take up the wear in the knife bar are dispensed with, and a simple bevel gib is screwed up by one nut on top, always keeping the knife bar firm and true. There is no dulling of the knife, as the knife-dulling surfaces are dispensed with; it saves the expense of the knives, saves grinding, sticks, etc., which are sources of annoyance and expense on other cutters.

The Cutting of Labels.—There are various contrivances for this purpose; but the label-cutting machine in general use is a contrivance resembling a small platen, which presses the cutter through the labels (100 at a time); the cutter is then removed, and the labels delivered. The printed sheets are worked with straight lines on the waste part of the sheet, and cut with scissors, and then laid to a straight edge. The cutters are about an inch and a half deep, made of steel to the required shape, especially when a large number of shapes and sizes are in requisition, and are very costly. They are made sloping towards the edge to give delivery from the back; the cutters are not fastened to the press in any way, and have to be directed to their position on the sheets by the eye, so that various shaped or sized labels may be printed on the same sheet, and cut with perfect ease by their respective cutters. The platen of a guillotine paper-cutting machine, or an envelope cutting press may be used, or the cutters can be made with handles, to be used with a mallet or heavy hammer. The cutters should be struck into soft lead.

Transparent Paper.—The following methods for rendering paper transparent are given. Using castor oil answers as well as any other method, the best recipe being: Of castor oil five parts and of ether one part; place the paper upon a sheet of glass, and spread the solution thickly over it; well warm it till the oil has thoroughly soaked into the paper; when cool remove the superfluous oil and again warm. Another method adopted is by using Thomas's india-rubber solution, two parts, dissolved with two parts Canada balsam in three parts pure benzole, and rubbing well in with a piece of cotton wool till thoroughly soaked and dry. Passing through melted paraffin wax is also an excellent method. This must be effected at such a temperature as to enable it thoroughly to penetrate the paper. Better *not* to iron, as so often recommended, but simply to warm, and with a piece of soft cloth take off the superfluous wax. A process by no means easy, which has been carried out with great success, is the following: Gum damar twenty parts, and gum elemi five parts, dissolved in a hundred parts of benzole. Pour into a flat dish, place the paper in one sheet after another, and allow it to remain for about five minutes; then remove and hang up to dry. Benzole must be constantly added to the solution because of its speedy evaporation.

Semi-transparent Paper Bags, as used in the candy business, are made by lining the interior surface of the bags with a thin film of fine paraffin wax. This is a mineral wax, as wholesome as bees'-wax, and not only never becomes rancid or changed in quality, but the bags treated with it are well adapted for wrapping every kind of perishable produce. They will preserve coffee, meal, sugar, and any other preparation from the atmosphere and from vermin. The use of these waxed bags is rapidly extending through every department of commerce and industry.

To Prepare Paper for Transparent Printing.—The secret of this lies entirely in the preparation of the paper. Thin plate paper is coated with good flour or starch paste evenly laid on with a brush and dried slowly before a fire. When dry another coating, of a strong solution of

gum or gum and starch, is given, and when this is dry the sheet is run once or twice through a rolling press, or pressed between zinc plates in a hydraulic press, which ensures an even surface for printing on. If the tablet is to be affixed to glass the printing is done in the ordinary rotation of colours in the usual way. The coating of gum rendering the surface adhesive, a slight damping is all that is necessary to affix the tablet to the glass.

Papers Sized with Resin Size are found to have a more or less acid reaction due to free sulphuric acid, which has never been observed in samples sized with animal glue. The acid is probably derived from the alum or aluminum sulphate used in sizing, which is decomposed by contact with the vegetable fibre, as it takes place in dyeing, a basic salt being deposited upon the fibre, and a portion of acid liberated.

For Paper Sizing, caseine of milk, which has the same chemical composition as egg albumen, is a good and cheap substitute. It may be dissolved in slightly alkaline water, especially in very dilute aqua ammonia.

Parchment Paper.—This may be rendered impervious to oils by steeping in a hot solution of gelatine, to which 2½ or 3 per cent. of glycerine has been added, and drying. To render the same paper waterproof, it is soaked in sulphuret of carbon, containing in the solution 1 per cent. of linseed oil and 4 per cent. of caoutchouc.

Artificial Parchment.—A strong artificial parchment, impermeable by water, and capable of serving for the diaphragm in osmotic operations on solutions of impure sugar, etc., is made as follows: The woollen or cotton tissues are freed by washing from the foreign substances, such as gum, starch, etc., which may cover them. They are then placed in a bath slightly charged with paper pulp; and to make this pulp penetrate more deeply, they are passed between two rollers, which slightly compress them. The principal operation consists in steeping the product for a few seconds in a bath of concentrated sulphuric acid, after which it undergoes a series of washings in water and ammoniacal

liquor, until it has lost all trace of acid or base. It is then compressed between two steel rollers, dried between two others, covered with felt, and finally calendered, when it is fit for use.

How Paper Napkins are Made.—The Japanese paper napkin is still handmade, and the method of making these is full of interest. Bamboo is the raw material used. The stalks are first crushed with a wooden hammer, then placed in a cemented tank. Water to cover and a quantity of lime are added, the material being left thus to decompose for about forty-five days. It is then removed, washed with fresh water and placed in a second pit, similar to the first, where it is allowed to soak for a similar period. The fibrous matter, much softened, is placed in a stone mortar, which is used with a stone pestle worked by the foot. Here the fibrous material is crushed until it has been reduced to a pulp. It is next placed on a platform and trodden by foot until the water has been partly driven out and the pulp becomes sticky. The pulp is then removed to a third cemented vat, partly filled with clean water, and is stirred until the mixture has attained the right consistency. The material is now ready for the final operation. For this a screen-like implement is used. This consists of a frame 2 ft. 4 in. × 9 in., supporting brass wires running crosswise and lacquered bamboo strips lengthwise, forming a fine network. A second frame of thin wood fits closely upon the screen, its outside rim being extended slightly to retain the quantity of pulp required for a single sheet. A third frame holds these together, and, by its projecting sides, furnishes a grip for the hands during manipulation. The complete implement is now dipped in the vat so that the screen becomes covered with pulp. It is lifted out horizontally and shaken to distribute the pulp evenly. Most of the water passes through the netting, and the outer frame being removed, the inner frame is placed in an inclined position to drain. When the water ceases to pass off, the screen is inverted and the soft sheet is allowed to fall out upon a board arranged for that purpose. Thus the operation proceeds, the sheets being placed one on another until the pile is some three or four inches high. A second

board is now superimposed, and the whole placed under a long wooden lever near its attached end. By weights placed on the free end of the lever the sheets are subjected to pressure, which removes the superfluous water. On being released from the press the sheets are taken out, placed in a split bamboo and hung in the sun to dry.

Gummed Paper.—The tendency of paper when gummed (as postage stamps, labels, etc.) to curl up is very tiresome, and much waste is often caused through tearing. It is said that this evil may be avoided by adding a little salt, sugar, and glycerine to the gum—very little of the latter, however, because otherwise the gum does not dry thoroughly. The gummed paper must not be dried in too great a heat. Another peculiarity of gummed paper is its greater liability to curl up the thicker it is. The thinnest paper possible under various circumstances should be used.

To Cut Gummed Paper.—Place a sheet of strawboard the full size of the paper on each side of the stock, and keep it there throughout the cut. Whenever the gummed paper begins to curl under the strawboard, slip a light rubber band around each cut as it is taken from the cutter. These can be placed near either end to be out of the way of the next cut.

Tearing of Papers.—When paper is torn it is found that the individual fibres are not broken by so doing, but are pulled asunder. From this it follows that the strength of paper does not depend so much upon the strength of the individual fibres as upon the way in which they are felted together. It will be easily understood that rag fibres, when thoroughly beaten with blunt tackle, so as to unravel the ends, can be felted together exceptionally well, and will produce very strong papers, while straw and esparto, whose fibres are smooth and pointed, produce papers which have very little resistance to tearing.

Granulated Paper.—Take some sheets of strong, unglazed paper; make a mixture of clear starch; strain it through a sieve, and, with a brush, spread a layer evenly on the surface of the paper; then leave it in the air to dry.

Afterwards place the paper thus treated between wet sheets, in the same manner as if it were india transfer paper, so that it may become slightly damp. Put a stone on the press, and place the paper on the stone, face upwards; take a cloth, the texture of which is more or less close, according to the grain to be obtained; give a moderate pull at the press, and, finally, leave the paper to dry again in the air. This process, which is quite elementary, places the litho printer in possession of granulated paper ready for the draughtsman.

Set-off Paper.—A capital one may be made by lightly rubbing with glycerine. This is preferable both to oil and paraffin wax.

Colouring and Drying Tissue Paper.—Mr. R. Crompton, of the well-known firm, has patented an improved process of treating tissue and other paper in continuous rolls after manufacture with various solutions, chemicals, colouring matter or dyes, and then drying the same. The invention is applicable to the manufacture of tracing, waterproof, and cheque paper, and almost any kind which requires chemical treatment after manufacture. The tissue or other paper is passed in a vertical direction between two pressing rolls, covered with felt or other suitable material, supplied with dye; this serves to impregnate the paper with the colouring matter whilst removing surplus of same. The paper is then passed unsupported through a drying apparatus arranged close to the pressing rolls.

Delivering Printed Work.—It is an easy matter to please or displease a customer. And first impressions are always the best. When work for a customer is finished, the first thought should be to deliver it in the way which shall most nearly bring it to a favourable consideration. Employ a neat wrapping paper; take as much pains in wrapping the package as a druggist would in wrapping a package of pills; make it neat; keep it clean; see that it leaves the shop and enters the customer's office as neatly as though a jeweller were delivering diamonds. A little care in this direction is of great service in pleasing a customer and making him feel satisfied with the work.

Mill-Boards, or properly "milled" boards, are strong flexible boards made chiefly of old rope. They are so called because they are squeezed or rolled in the process of manufacture. The best sorts are made from the same material as brown paper—old tarred rope; besides this, old coal sacks are used, with admixtures of various fibres. Mill-boards are made in the same way as handmade paper, that is, in a mould, to ensure firmness and solidity. To give them the necessary smoothness, they are finished by being rolled or milled by powerful iron and steel rolls.

Etching Papers.—The paper used in printing etchings depends in a great measure on the character of the plate. The smooth white paper made for line-engravings is not used. Whatman's drawing paper is a favourite. Whatman's vellum paper also brings out rich and heavy work with splendid effect, its exquisite surface giving an especial delicacy to the finer points of the plate. It is prepared by long soaking in water to extract the size, and is then run through a press several times before it is used to render it perfectly smooth of surface. Japanese paper is used to a great extent, and produces excellent impressions. Its high reputation is due to a silkiness of texture and surface, which is produced by the cocoons of the silkworm, largely used in its manufacture. Parchment is noted for the brilliant and strong impressions it produces; vellum is a stronger material than parchment, more solid and not transparent; vellum is made of calf-skin, while parchment is the finest of sheep-skin carefully cured, shaved down and freed from imperfections. Satin proofs are a novelty in the printing of etchings. Satin possesses a smoothness and brilliancy of surface, calculated to bring out the contrast of light and shade of a bright plate. Where figures and drapery form a feature it is unapproachable; and satin proofs of any subject rank among the valuable ones.

Anti-Forgery Paper.—To prevent alterations in writing, the following process of preparing paper is recommended by an American inventor: Add to the sizing five per cent. of cyanide of potassium and sulphide of antimony, and run the sized paper through a thin solution of

sulphate of manganese or copper. Any writing on this paper with ink made from gall-nuts and sulphate of iron can neither be removed with acids nor erased mechanically. Any acid will immediately change the writing from black to blue or red. Any alkali will change the paper to brown. Any erasure will remove the layer of colour and expose the white ground of the paper, since the colour of the paper is only fixed to the outside of the paper without penetrating it.

Indian Koos Grass for Paper.—Experiments made with Koos, one of the grasses of India, shows that it has a clean and strong fibre. Shipments of the grass were made down the Ganges, on the upper reaches of which it appeared to abound, to the paper mills at Titaghur. There it secured prompt attention from paper makers, but after a good deal of care had been given to it, it had to be abandoned because it did not readily render itself amenable to bleaching by means of the ordinary processes. The paper made from it has the tenacity of bank notes, and it is said that, but for its obduracy in the matter of bleaching, Koos would have formed the ideal material for paper making.

Australian Paper.—It is stated that from experiments made in Melbourne excellent papers have been made from eleven species of Eucalyptus bark without any addition of rags. This substance, which can be obtained in immense quantities, bleaches easily.

Preservative Transfer Paper.—In two quarts of water dissolve three decagrams dextrine, soak for about two days, then boil it and allow it to cool. Add six decagrams of gelatine, put over fire again and dissolve the gelatine, taking care that the substance does not get to boiling, for in this the gelatine, together with the dextrine, would lose some of its adhesiveness. Let the whole become of a molasses-like consistency. This solution, when warm, is to be filtered, and with it a heavy supersized and calendered book paper may be coated like transfer paper. It is advisable to add to the solution about half a pint of alcohol and ten

drops of carbolic acid, and two or three ounces of glycerine to avoid a curling up of the edges of the paper. This may vary with the state of the temperature and the condition of the atmosphere; where in dry days three ounces will be required, two ounces will suffice on wet days.

Another Recipe for Transfer Paper.—Starch, six ounces; gum arabic, two ounces; alum, one ounce. Make a strong solution of each separately in hot water; mix and apply it while warm to the side of the leaves of paper with a brush. When dry, a second and third coat may be applied in the same manner, the paper having been well pressed to make it smooth.

Cloth Finished Paper. — A cloth finish is given to paper by applying to, or laying upon, opposite surfaces of paper, pieces of cloth, then subjecting the cloth and paper to pressure between smooth rollers or other smooth surfaces, and in finally removing the cloth from the paper. The paper or cloth may, if desirable, be moistened to facilitate the impress of the surface of the cloth into the paper; but this will not be necessary. The impress of the surface of the cloth into the paper may be done, as described, either before or after calendering the paper, or even during the process of calendering. A name or designating mark or ornament may be produced in the paper by delineating it upon the cloth by stitching, or in any other manner which will give it the necessary projection.

To Prepare Paper for Negative Printing.—The best method of preparing, sensitizing, and fixing ordinary plain paper for printing from a negative in black on a dead white ground, is to dip the paper into a solution of ammonium chloride, then float on a silver bath, which will form silver chloride.

Carbon Paper.—To make carbon paper, take of clear lard, five ounces; beeswax, one ounce; Canada balsam, one-tenth ounce; lampblack, q. s. Melt by aid of heat, and mix. Apply with a flannel dauber, removing as much as possible with clean woollen rags.

Unsized Plate Paper may be made impervious to moisture by immersing it in a solution of mastic in oil of turpentine, afterwards drying by a gentle heat.

Smooth-Surfaced Paper.—The remarkable finish of American paper is stated to be due to the addition of a mineral substance called "Agalith," which is a silicate of magnesia, something like asbestos in nature and texture, and is found only in the United States.

Manufacture of Paper Pads.—The object of this invention is to bind together sheets of paper forming a pad in such a manner that no binding composition will adhere to the sheets when removed from the pad; and it consists, essentially, in placing on the edge of the paper to be bound a piece of linen or other porous material and covering the outer surface of the material with a coating of glue or paste, which will soak through and cause the material to adhere to the edge of the paper, so as to bind the sheets together as desired. This binding is said to be much stronger than the old style. The same effect might be produced by coating one side of the material, and when it is to be used damping or heating it, so as to make it moist and cause the material to adhere to the edge of the paper when pressed against it.

Impermeable Wrapping Paper.—Dissolve one and a half pound of soap in a quart of water; then dissolve two ounces of gum arabic and six ounces of glue in another quart of water. Mix the two solutions; warm the mixture; dip the paper in the liquid; pass it between two rolls (a clothes-wringer, for example), and put it to dry. In default of rolls, hang the paper up, so that it may drip well, or better, pass it between two sheets of dry paper. Then let it dry in mild temperature.

Wrapping Paper for Metals.—Paper specially prepared for wrapping metallic articles liable to tarnish is made by sifting on the sheet while in process of manufacture, and before pressing or drying, a metallic zinc powder known in commerce as blue powder, to the extent of one half the weight of the dried paper. The sheet is

then run between the press rolls and over the drying cylinders in the ordinary manner. The zinc powder will adhere to the paper and be partly incorporated with it in greater or less quantity as the sheet of paper pulp is more or less thick or wet. The paper may also be sized and then dusted with the zinc powder, or the zinc powder may be mixed with size, starch, etc., and then be applied to the surface of the paper.

Cleaning Prints and Printed Papers.—The best method, which does not disintegrate or in any way harm the fibres of paper, is to steep the print in a bath of an ounce of Condy's Disinfecting Fluid reduced with a pint of warm water. The paper, which will have assumed a brownish tinge, is washed two or three times in tepid water and then steeped in a bath of one ounce of sulphur*ous* (not sulphur*ic*) acid reduced with a pint of warm water, which will restore the colour. Finally, wash three or four times in warm water, drain, press under blotting paper and dry under pressure.

Washable Paper.—Writing and drawing papers first receive a thin coating of a mixture of glue, or some other suitable adhesive substance, with zinc white, chalk, barytes, etc., and the colour for producing the desired tint. They are then coated with silicate of soda, to which a little magnesia has been added, and dried at a temperature of 25° C. during ten days or so. Paper thus treated is said to possess the property of preserving writing or drawing in lead pencil, chalk, or Indian ink.

Pinched Post.—This size is said to have resulted from the double invention of paper-making machinery and paper-cutting machinery, the former preventing the waste of the unfinished deckle edge of paper made by hand, and the latter saving every second shaving which the plough-cutting press necessitated. Our sizes, however, are still taken from the hand-mould deckle, and we call post $19 \times 15\frac{1}{4}$, and large post $21 \times 16\frac{1}{2}$. Country travellers representing some of the first houses in the paper trade show samples accordingly, although the reams when cut up and re-tied measure no more than 9×14. Indeed, it is useless to send

out post octavo larger than $4\frac{1}{2} \times 7$ if it is to be used with the standard sizes of envelopes. The graduation of the four leading sizes of writing paper, post octavo, large post octavo, post quarto, and large post quarto, would be greatly improved by shortening the folio of both post and large post one inch. If this change could be made with the general consent of the trade, $14\frac{1}{2} \times 19$ and $15\frac{1}{4} \times 21$ would have sufficient margin for the present width of the page of both post and large post octavo to be maintained, and the depth of each page to be half as much again as its width, thus ensuring greater symmetry than now exists. The proposed alterations are as follow: Post folio, $14\frac{1}{2} \times 19$; post quarto, $6\frac{3}{4} \times 9$; post octavo, $4\frac{1}{2} \times 6\frac{3}{4}$. Large post folio, $15\frac{1}{2} \times 21$; large post quarto, $7\frac{1}{2} \times 10$; large post octavo, $5 \times 7\frac{1}{2}$.

A Sheet of Paper.—The mere placing of dry fibres one on another, however long and strong and intimately mixed, will not make a sheet of paper. A sheet of strong paper can only be produced by fibres possessing the quality of losing their elasticity in water as they become soft and recovering it again when dry. When moist the fibres settle down in every conceivable direction, forming a confused interlaced mixture, and in drying each one recovers its original elasticity. The longer the fibre and the more intricate the mixture the stronger will be the sheet of paper.

An Early Experiment in Wood Pulp as a Paper comes to light in the "New York Magazine" of 16th September, 1795: A very interesting discovery has lately been made in the State of Pennsylvania, in the art of paper-making, by a Mr. Biddis. It is likely to reduce the price of that important article by producing a saving of rags. The invention consists in reducing sawdust to a pulp, mixing it with the pulp of rags, and forming the paper from this mixture. A specimen of paper made in this manner has been seen, certified to be composed of one-fourth of sawdust, the remainder of rags. The body and surface of the paper appear as good as usual; colour verges a trifle towards a greenish yellow, which might be effectively

remedied by indigo. In a paper of a coarser kind a great proportion of sawdust may be used, even in some as far as three-fourths.

The Processes for making Wood Pulp.—These are now fewer than half a dozen: The Mitscherlich, using bisulphite of lime; the Francke, in use at Mölndal, near Gothenborg (Sweden), bisulphite of lime, in rotary cylinders of steel lined with lead; the Eckmann process, used at Bergvik (Sweden), bisulphite of magnesia, in vertical cylinders; the Graham process, used in England, uses sulphite of lime and sulphite of magnesia, with a simultaneous treatment of bicarbonate of lime and magnesia, and then treatment with sulphureous acid in close vessels. In addition to these there is the latest process of Zahony and Kellner, used at Goritz, in Austria, which is said to give excellent results. Bisulphite of lime is used, but there are great advantages claimed in the complete utilization of the sulphureous acid in doing away with steam or sulphuric acid in the bleaching. The method has been adopted in several Austrian mills.

Enamelling Cardboard and Pasteboard.—Dissolve ten parts of shellac in a sufficient quantity of alcohol, and add ten parts of linseed oil. To each quart of the mixture add about one-fourth of an ounce of chloride of zinc. The board may be immersed in it or the solution applied with a brush. The board is thoroughly dried and the surface is polished with sand-paper or pumice before applying this preparation.

Enamel Surface for Paper or Cards.—A formula for the brilliant white satin enamel, applied sometimes to French cards and *papier de luxe*, is here given: For white, and all pale and delicate shades, take 24 parts by weight of paraffin, add thereto 100 parts of pure kaolin (china clay), very dry, and reduce to a fine powder. Before mixing with the kaolin, heat the paraffin to fusing point. Let the mixture cool, and it will form a homogeneous mass, which is to be reduced to powder, and worked into a paste in a paint-mill with warm water. This is the enamel ready for application. It can be tinted according to fancy.

Enamel Paper.—The pigments used in enamelling paper are metallic substances such as will spread smoothly and take a polish, and include white lead, oxide of zinc, sulphate of barytes, china clay, whiting, chalk, in a menstruum, or upon a previous coating of glycerine, size, collodion, water, varnish, etc., polished between calendering or burnishing cylinders.

Satin Paper.—The Belgian or satin paper, which has the appearance of silk or satin, has a calendered and sized book paper as a foundation layer. The paper is printed with the zinc white ground in No. 3 varnish, and when dry the sheets are run through a calendering machine. Where the latter cannot be had, take a lithographic stone polished as smoothly as possible, and with oxalic acid, water, and paper, make a paste (oxalic acid must be powdered before the water is poured on it), and rub it over the stone until it has the appearance of a looking-glass. This can best be done by using a large piece of cork smooth on the bottom, and a piece of woollen cloth or flannel over it. With this dabber rub the oxalic acid on the stone with heavy pressure just as in stone grinding. When the printed and asbestos-dusted sheets are pulled through the press—the printed side, of course, to the polished surface of the stone—the asbestos will be by this pressure fastened to the sheets by its lengthy fibres, and thus give the satin-like appearance spoken of.

Ornamentation on Paper.—A new method of producing designs and patterns in colours upon the surface of paper consists in the use of one or more rollers or cylinders of elastic material, such as vulcanized india-rubber, filled with compressed air. The diameter of these rollers or cylinders is determined by the pressure of the air. These rollers or cylinders are closed at the ends, and supported by an axle in a frame. Any suitable design or pattern is produced upon the surface of these rollers or cylinders. This may be done by cutting the design or pattern out of the surface, or by cutting the ground out of it; or it may be produced by a mould. The rollers revolve by contact with the advancing paper, and projecting portions of its

engraved surface take up more or less of the colour and the designs or patterns in the moist colour on the paper. It is said that these cylinders will produce designs or patterns with very soft shading, which have not been produced hitherto by any mechanical contrivance.

Origin of Blue Writing Paper.—A story has been told concerning the origin of blue-tinted paper now so much in vogue for commercial uses. The wife of an English paper manufacturer named William East, going into the factory on the domestic wash-day with an old-fashioned blue bag in her hand, accidentally let the bag and its contents fall into a vat full of pulp. She thought nothing of the incident and said nothing about it either to her husband or to his workmen. Great was the astonishment of the latter when the paper turned out a peculiar blue colour, while the master was vexed at what he regarded as gross carelessness on the part of some of the workmen. His wife kept her own counsel. The lot of paper was regarded as unsaleable and was stored for four years. At length East consigned it to his London correspondent with instructions to sell it for what it would bring. The unlucky paper was accepted as a novelty and was disposed of in open market at an advance in price. Judge of the maker's surprise when he received an order for a large supply of the despised blue paper! Here was a dilemma; he was totally ignorant of the manner in which the paper had become blue in colour, and in his perplexity mentioned the matter to his wife. She promptly enlightened him, and he in turn kept the simple process secret and was for many years the monopolist of the blue commercial paper manufacture.

Paper from Moss.—A report has been made in reference to the manufacture of paper from a white moss growing abundantly in Norway and Sweden. Only the mouldering remains of the plant are used, the living growth never being interfered with, and the paper made from this decayed vegetation is represented as being of unusual strength and superior to paper made from wood. If this discovery is all that is claimed for it, it cannot fail to lead to important results, because paper made entirely from wood-pulp is not

strong enough without an admixture of cotton waste or rags to give it fibre. Moss has more fibre in it than wood, and is, therefore, not in need of fibrous reinforcement to impart to it the necessary consistency. Not being used until dead, the moss is by nature deprived of the soft and aqueous portions, and only the tough veins or fibres are gathered for the paper mill. As the tested moss may be had for the gathering, it is cheaper than rags. Any cheap fibre which will add to the strength of wood-pulp is sure of careful examination from paper-makers.

Chinese Rice Paper.—The bloom and softness of rice paper—which, by the way, is not made of rice, but of pith—have always attracted admiration, but unfortunately this paper is too brittle for decorative purposes. The fault is remedied by laying the paper in a slightly warm weak alcoholic solution of lime, which is drawn off and the paper dried on glass plates, the result being pliability without loss of toughness. It retains its velvety surface.

Straw Board is made principally from wheat or rye straw. The process consists in boiling the straw with quicklime in a wooden digester, taking steam from a boiler. The straw is packed in layers with lime between, and the whole boiled for ten or twelve hours. Straw is composed of a tube of woody fibre and cellular tissue, its surface containing silicates of potassa and soda with free silica. The woody fibre also contains silica. To this silica the straw of grain or grass owes in great part its strength. In boiling, the lime and the silica combine, leaving the straw in a soft pulpy state. The mass is ground into pulp, and then drawn into a vat containing water, and kept agitated by a series of revolving arms. A wire-gauze cylinder is adjusted which revolves partially beneath the surface of the fluid mass. The pulp adheres to the gauze, and is carried to another cylinder, around which an endless belt of felt runs. The latter cylinder presses upon the gauze, and causes the pulp to adhere to the felt and condense so as to give it enough consistency to be taken up by yet another cylinder, called the "forming cylinder," one of a pair made of polished metal, and by these the pulp is strongly compressed. The

pulp is wound round the "former" until the proper thickness, determined by an indicator, is obtained. Along the former cylinder there is a groove planed out, through which the operator now rapidly passes a wooden knife, thus severing the soft board, and at the same time he unwinds the sheet and removes it. These sheets are then dried. Woollen rags are sometimes ground and mixed with the straw pulp, making a much darker coloured and heavier board, and worth more than the pure straw board. The white lining of these boards was pasted by hand, but now a machine does this. This machine pastes the boards, lays on the white paper from a continuous roll, dries, presses, and calenders them, so that when the boards leave the machine they are ready for use.

Bronzing Paper.—Dissolve gumlac in four parts by volume of pure alcohol, and then add bronze, or any other metal powder, in the proportion of one part to three parts of the solution. The surface to be covered must be very smooth and carefully polished. The mixture is painted on, and when a sufficient number of coats have been given, the object is well rubbed. Another method is to coat the object with copal or other varnish, and when this has dried so far as to become "tacky," dust bronze powder over it. After a few hours the bronzed surface should be burnished with a burnisher of steel or agate.

Blotted Notepaper is simply a sheet of note smothered with blots of all shapes and sizes. The paper is of various tints, and if say a light blue, then the blots are printed in a blue one shade darker than the paper. So the changes are rung, red on red, green on green, and so on. If black on white, then the blots are stippled a very light gray, which gives the appearance of blotting paper having been used.

Preparing Paper for Copying Purposes.—This is a process for treating paper so as to render it permanently moist for copying purposes. One pound of the salt known as the "chloride of magnesium" is dissolved in a moderate quantity of cold or warm water, and it is ready for use. From half a pound to a pound of water to a pound of

chloride of magnesium is said to be the amount, but more or less can be used according to circumstances. Apply this solution to the sheets of ordinary copying-paper, whether in book form or otherwise, in any usual and well-known manner, and preferably by applying the compound to cloth pads well saturated with the liquids, and then place the pads between a suitable number of leaves; then apply pressure, at first moderate, until the absorption of the paper is complete; then remove the cloth paper and apply under the press a strong pressure, and the sheets so treated are ready for copying purposes, the use of the solution of chloride of magnesium being the base of this invention. In all cases use copying inks or fluids, which are preferable. Paper prepared thus will remain moist at any ordinary temperature, and if made dry by any extraordinary heat will regain its moisture upon being subjected to the ordinary temperature.

Paper Pulp from Cotton Stalks.—A writer in the "Scientific American" says that several samples made from the hulls and stalks of the cotton plant have lately been on view at Atlanta, Georgia. The pulp is as white as snow, and it is said that it can be converted into the finest writing paper. The ligneous substances of the hulls and stalks are removed by a new process. Fifty per cent. of the fibres are extracted from the hull, which has hitherto been used either for fuel in the mills or for fertilizing purposes, and 38 per cent. is obtained from the stalks, which have generally been allowed to rot in the fields. If the process proves successful, the value of these comparatively useless products will be increased tenfold.

The Protection of Paper and Card Stock.—All paper and card stock should be kept wrapped and covered on both sides, as well as at top and bottom, from dust and smoke, and from the discoloration which takes place. Every time a sheet is taken off the top cover the pile again, or the top sheet will be spoiled. Some think it unnecessary to cover printed work, but they are in error, for it is as liable as fresh stock to have the edge discoloured; and if the work is not to be trimmed after printing, this may

prove a serious matter. Never handle printed or unprinted paper or card with dirty or greasy hands. If this is done, one is liable to spoil two sheets. Paper stock, if in cases, should be kept carefully boxed and covered, until used. Flat papers—note, letter, folio, half-medium, demy, and others, ruled or unruled—should be carefully shelved and assorted by weights, colours, and sizes, and labelled. The same applies to cards and envelopes.

A Strong Flexible Paper.—One which is impervious to dampness is produced by taking a paper composed of strong fibres such as manila, jute, linen, or the like, and of a quality capable of sustaining a tensile strain of no less than 200 pounds per inch, in the direction of its length when made 12 square feet to the pound. When in the process of its manufacture, or after it has been made, it is rendered impervious to water by the application of suitable size. The paper so prepared is then passed through breaking stamps or rollers, so as to render it limp or flexible; and this may be done either while the paper is yet in the paper-machine, or in a separate machine adapted for the purpose. It is sometimes necessary to pass the paper several times through the breaking rolls and sometimes in contrary directions. When the uses to which it is desired to apply the product demand a very smooth surface, the paper thus rendered flexible is passed through calender rolls in order to smooth it.

Drawing Paper, as well understood, must be hand-made, for no machine has yet been able to "shut together" the fibres of a sheet of paper with anything like the perfection attainable by the human hand, nor to produce a sheet of equal toughness, or so little liable to warp when damped. The evil attending the use of chlorine and other chemicals in paper has been of late years so completely overlooked, that one is justified in speaking of it as an "unconsidered danger to water-colour art."

Letter and Note Papers.—Confusion is often caused by using the wrong term. Letter papers are quarto and note papers octavo in size. This should be impressed on the memory.

Splitting a Sheet of Paper.—It is said that this can be done by laying the sheet of paper on a piece of glass, soaking it thoroughly with water, and then passing it smoothly all over the glass. With a little care the upper half of the sheet can be peeled off, leaving the under half on the glass. Let this dry and it will come off the glass very easily. Of course the glass must be perfectly clean.

Table to Calculate how many Pieces of Wall-Paper a Room will take.—Some stationers deal in wall-papers and frequently undertake paperhanging. To these the accompanying table will be of value.

Height of room in feet from bottom to top.	The figures in the top line show the measure round the room in feet, including doors, windows, etc. The figures below the line show the number of pieces required.													
	28	32	36	40	44	48	52	54	60	64	68	72	80	84
7 to 7½ feet.	4	4	5	5	6	6	7	7	8	8	9	9	10	10
7½ ,, 8 ,, ...	4	4	5	5	6	6	7	8	8	9	9	10	11	11
8 ,, 8½ ,, ...	4	5	5	6	6	7	7	8	8	9	9	10	11	12
8½ ,, 9 ,, ...	4	5	5	6	7	7	8	8	9	9	10	11	12	12
9 ,, 9½ ,, ...	4	5	6	6	7	7	8	9	9	10	10	11	12	13
9½ ,, 10 ,, ...	5	6	6	7	7	8	9	9	10	10	11	12	13	14
10 ,, 10½ ,, ...	5	6	6	7	8	8	9	10	10	11	12	12	14	14
10½ ,, 11 ,, ...	5	6	7	7	8	9	9	10	11	11	12	13	14	15
11 ,, 11⅔ ,, ...	5	6	7	8	8	9	10	10	11	12	13	13	15	16

To Make Emery Paper.—Fix a sheet of stout blotting paper on a board, gluing it round the edge. Put emery powder into a sifter, the mesh of which has the requisite degree of fineness, and, rapidly covering the paper with thin hot glue, shake the sifter lightly over the paper until it is evenly covered, and leave to cool. When dry, detach the paper and shake it vigorously to remove loose grains.

To Make Blue Sugar Paper.—A very good recipe for this is as follows: To $1\frac{1}{2}$ lb. of pulp add 24 oz. verdigris, 3 lb. alum, and 50 to 55 cans water, which have to be boiled together. After the pulp has lain for a few days it is taken out, the water drained off, and the pulp placed in a decoction of Brazil wood, being then worked up as for ordinary paper.

Iridescent Paper.—Boil in water eight parts (by weight) of gall-nuts, five parts of sulphate of iron, four each of sal ammoniac and sulphate of indigo, and one-eighth part of gum arabic. Wash the paper in this decoction, and then expose it to the fumes of ammonia until the desired result is reached.

Papier Mâché is made either by cementing together sheets of paper and afterwards coating them with oil, and then baking them, finishing with varnish, or by re-pulping old paper or from new pulp. In the latter case, wood is frequently employed, besides other fibrous material. To this end it is pulped in the same manner as for paper, and the pulp then compounded with the necessary constituents for its production, such as oil, pitch, resin, soda, sugar of lead, glue, etc. From this, in a pasty or doughy state, the articles are made by stamping or moulding, and then baking. Inlaying and such work is done while in a plastic state, or the papier mâché is made into blocks or sheets, then finished, and afterwards cut and worked up in the same manner as wood. The uses to which this substance is put are very numerous, such as the making of furniture, book-backs, albums, buttons, medals, picture-frames, and many other purposes.

French Papier Mâché.—The perfection to which the French manufacturers of papier mâché have carried that art appears to be due not only to the unequalled quality of the raw material, which is an invariable pre-requisite, but to the care exercised in its subsequent treatment when made up into the various artistic forms of which it is so susceptible, for, though this material is simply moulded and pressed paper, it is easily turned in the lathe and made into light and indestructible balls and beads, or fashioned

into inkstands, caskets, cylinders, and many other objects. The varnishing is a special feature, this operation being reserved for the thick black varnish which is applied to it in several coats, with an intervening stay of a night in a very hot-air heated drying-room, so that when it comes from the latter the varnish is very hard, and is free from blisters and cracks. The baking is the important point upon which success depends, because when this operation has been too greatly prolonged, the varnish scales off and cracks, or, when it has not been carried to a sufficient extent, the surface will remain sticky; the desideratum kept in mind, therefore, is that a certain temperature be not exceeded.

STICKING PAPER TO METAL.—Paper pasted, gummed, or glued on metal, especially if it has a bright surface, usually comes off on the slightest provocation, leaving the adhesive material on the back of the paper, with a surface quite bright and slippery. The cheaper description of clock dials are printed on paper and then stuck on zinc; but for years the difficulty was to get the paper and the metal to adhere. It is said to be now overcome by dipping the metal into a strong and hot solution of washing soda, afterwards rubbing perfectly dry with a clean rag. Onion juice is then applied to the surface of the metal, and the label pasted and fixed in the ordinary way. It is almost impossible to separate paper and metal thus joined.

TRACING PAPER is very expensive in the market, and those who would like to make their own may do it in the following manner: Mix well together 75 parts of olive oil and 25 parts of benzine. With a brush put it on best tissue paper, and hang it up for about thirty-six hours. This is a very transparent tracing paper: until the benzine has evaporated, it is also extremely inflammable.

ANOTHER METHOD.—Steep sheets of paper in a strong solution of gum arabic, and afterwards press each sheet between two dry sheets of similar paper, to take off the superfluity of the liquid. This will convert these sheets of paper into a tracing paper. The solution must be strong—about the consistency of boiled oil.

Coloured Wall-Papers.—In the manufacture of coloured wall-papers the white paper is first coated with a uniform ground tint. This is done by machine. The paper cannot be rolled until perfectly dry. A very high temperature and a considerable number of persons are necessary for that purpose, and the losses during drying, both accidental and by the negligence of employés, are considerable. As it is necessary to have on hand a great variety of ground tints, this operation requires a large stock of coloured papers. The designs for the coloured figures are reproduced by engravers, each colour on a separate wooden cylinder. The colours used for printing are generally in the form of paste mixed with glue. The engraving must, therefore, have enough relief for the purpose of printing, to prevent the details of the colours from blending.

Hanging Paper for Damp Walls.—This method consists of coating a lining paper on one side with a solution of shellac spirit of somewhat greater consistency than the ordinary French polish, and then hanging it with the side thus treated to the damp wall. The paper-hanging is then performed in the usual manner with paste. Any other resin that is equally soluble in spirits may be used in place of the shellac. According to representations, this process is found equally effective in preventing the penetration of dampness.

Non-Poisonous Vegetable Fly-Paper.—Powdered black pepper is mixed with syrup to a thick paste, which is spread by means of a broad brush upon coarse blotting-paper. Common brown syrup will answer, but syrup made from sugar is preferable, as it dries much quicker. For use, a piece of this paper is laid upon a plate and dampened with water. The paper may also be made directly at the mill by adding sugar to the pulp and afterwards a quarter to one-third of powdered black pepper, and rapidly working it into a porous absorbent paper.

To Clean Glazed Boards.—Glazed boards soiled with ink may be cleaned with a little turpentine rubbed on with a piece of flannel and finished with a soft duster.

To Waterproof Labels.—The label having been properly pasted on and dried, coat it first with a size prepared by adding as much alcohol to thick mucilage or gum arabic as this will stand without precipitating. When the sizing is dry, the label is brushed over with a solution of 50 parts of mastic and 1 part of storax in 165 parts of alcohol. In making the latter solution, add about 25 parts of sand, which mixes with the mastic and permits the alcohol to penetrate the mass more rapidly.

To Remove Grease Spots from Paper.—The following is a recipe for removing grease spots from paper: Scrape finely some pipe clay on the sheet of paper which is to be cleaned. Let it completely cover it, then lay a thin piece of paper over it, and pass a heated iron on it for a few seconds. Then take a perfectly clean piece of india-rubber and rub off the pipe clay. In most cases one application will be found sufficient, but if it is not, repeat it.

Another Remedy for Grease Spots on Paper.—Grease may be removed from paper in the following manner: Warm gradually the parts containing the grease, and extract as much as possible of it by applying blotting paper. Apply to the warm paper, with a soft clean brush, some clear essential oil of turpentine which has been boiled, and then complete the operation by rubbing over a little rectified spirits of wine.

Protection of Paper against Rats.—Waste paper makes a good thing to banish rats from buildings. Soak the paper in water in which oxalic acid in liberal quantities has been dissolved, and then, while wet, ram it tightly into the chinks through which the rats travel. The rats will never come near the place again.

A Method of Waxing Paper.—A box provided with steam pipes has an upper depressed and corrugated surface, with gutters fed by a funnel, in connection with a perforated plate, felt sheets, and a roller; the felt is first thoroughly saturated with melted wax paraffin, the temperature raised, and the paper waxed by placing the sheets simply on the felt bed and passing the roller over.

To take Creases out of drawing paper or engravings, lay the paper or engraving face downwards on a sheet of smooth, unsized, white paper; cover it with another sheet of the same, very slightly damped, and iron with a moderately warm flat-iron.

To make Postal Tubes.—The tubes now so largely used are made by rolling a sheet of the paper selected—cartridge or stout rope-brown—on a cylinder of wood of the required length and diameter of inside required. If you want a tube two feet long cut the paper to that width, and about a yard in length; paste the sheet evenly all over, and then proceed to roll tightly on the wooden cylinder. In about an hour the tube will be dry, and the cylinder may be pushed out.

Paper and Eyes.—A well-known French *littérateur* writes on paper of a greenish hue in order to save his eyes from the glare of white paper. Yellow writing paper is suggested by some experts, but according to some one else, the best paper for "copy" is whity-brown.

Antiseptic Paper is prepared by melting five parts of stearine, in which two parts of carbolic acid are well stirred. Five parts of paraffin are then added to the mixture. The whole is stirred as it cools, and put on the paper with a brush.

Tracing Cloth is thin muslin sized with isinglass and passed through polished rolls heated by steam. Tracing paper is either sized with isinglass and calendered, or oiled with linseed oil.

Oil Stains on Paper.—These may be removed from paper by applying clay powdered and mixed with water to the thickness of cream, and laid on for four hours.

Oiled Sheets for Letter-Copying.—The only preparation for this paper is to brush the sheets over on both sides with boiled oil mixed with litharge. The sheets must be hung up to dry singly, because, if placed in a heap too soon, they are apt to generate heat.

Safety Envelopes.—In making these envelopes, that part of the envelope covered by the flap is treated with a solution of chromic acid, ammonia, sulphuric acid, and sulphate of copper, on fine white paper. The flap itself is coated with a solution of isinglass in acetic acid, and when this is moistened and pressed down on the under part of the envelope a solid cement is formed, entirely insoluble in acids, alkalies, hot or cold water, steam, etc.

Another Safety Envelope.—The best way in which to secure the inviolability of an envelope is so to cut the flap that the end of it may turn over on to the right-hand corner of the face of the envelope—where the postage stamp will hold it securely. This plan, it is believed, has already been patented in this country.

Discoloration of Paper.—Experiment has shown that the discoloration is due to the action of light upon the paper containing ligneous substances, such as wood, straw, and jute. When the lignine is removed by chemical means, the effect is not produced. The yellowing is said to be due to a phenomenon of oxidation.

To Make Paper Tough.—A plan for rendering paper as tough as wood or leather has been recently introduced. It consists of mixing chloride of zinc with the pulp in the course of manufacture. It has been found that the greater the degree of concentration of the zinc solution, the greater will be the toughness of the paper. It can be used for making boxes, combs, for roofing, and even for making boots.

MUCILAGES

WATERPROOF GLUE.—A flexible waterproof glue can be made by rubbing up sufficient red lead into a given quantity of glycerine to make a paste of the consistency of molasses. Melt up, but do not *boil*, a good quality of hide glue, then add the other preparation in proportion of 1¼ ounce to each pound of the melted glue. This should be well stirred in while hot. Another glue of this class can be made by adding an ounce of powdered quicklime to the pound of melted glue and then stirring in a little raw linseed oil to make it flexible. For certain purposes the adhesive quality can be improved in ordinary glue by adding a spoonful of oxalic acid, and an equal amount of powdered chalk to neutralize the same.

SUBSTITUTE FOR GUM ARABIC.—A substitute for gum arabic, which has been patented in Germany, and is likely to be largely used for technical purposes now that good gum arabic is so scarce, is made as follows: Twenty parts of powdered sugar are boiled with 7 parts of fresh milk, and this is then mixed with 50 parts of a 36 per cent. solution of silicate of sodium, the mixture being then cooled to 122° F. and poured into tin boxes, where granular masses will gradually separate out, which look very much like pieces of gum arabic. This artificial gum copiously and instantly reduces Fehling's solution, so that, if mixed with powdered gum arabic as an adulterant, its presence could be easily detected. The presence of silicate of sodium in the ash would also confirm the presence of adulteration.

PASTE FOR LABELS.—For adhesive labels dissolve one and a half ounce of common glue, which has lain a day in

cold water, with two ounces of candy sugar and three-quarters of an ounce of gum arabic, in six ounces of hot water, stirring constantly till the whole is homogeneous. If this paste be applied to labels with a brush and allowed to dry, they will then be ready for use by merely moistening with a wet finger.

Gum Arabic.—It is usually stated that the preparation of this mucilage in the cold renders it less liable to become thick and muddy. The following has been recommended: The water is first heated to boiling, then allowed to cool to about 80° C. (176° F.), and this is then poured upon the gum arabic, which had previously been carefully washed with cold distilled water. The whole is well covered, set aside in a cool place, and frequently stirred. Solution will take place rapidly. Any water lost by evaporation is replaced before straining. The straining must be done by passing the mucilage through a woollen strainer, previously washed repeatedly with distilled water. The strained mucilage should be filled into small bottles (2 to 8 oz.), which had previously been carefully dried in a drying oven, and must be still hot when filled. They should be filled to about three-fourths of the neck and at once corked, the cork, if possible, being pushed down so as to meet the surface of the mucilage. Mucilage thus prepared is clear and bright, and, if put up as here directed, keeps well, though it generally becomes faintly opalescent after a few days. But this happens also to mucilage prepared by the cold process. If the mucilage is heated in a steam bath immediately after it has been strained, it will keep still better, but this second heating renders it quite opaque, which is not considered proper.

Preserving Gelatine.—A little carbolic acid will keep gelatine from decomposing.

Mountant for Photographs.—Some one experienced a difficulty in getting a suitable paste for mounting photographs before copying them in half-tone. To copy photographs it is not necessary to mount them. Use an ordinary photographic printing-frame, in which is a piece of perfectly clean crystal plate glass. Lay the unmounted photo-

graph face down on the glass, close down the back of the printing-frame, and if you have sufficient flexible packing in the frame and enough pressure, any unmounted photograph will be pressed out in perfectly flat contact with the glass. In copying through glass, the only precaution to be taken is that no light object is behind or around the camera that could be reflected by the glass into the lens. If obliged to make your own mountant, here are formulae:

Dextrine	6 ounces
Sugar	1 ounce
Alum, powdered	$\frac{1}{4}$ ounce
Water	8 ounces
Carbolic acid	15 minims

Or the following may be used:

Gelatine	1 ounce
Water	3 ounces
Alcohol	3 ounces
Glycerine	$\frac{1}{4}$ ounce
Carbolic acid in solution	10 drops

Liquid Glue.—It is not only acetic acid which may be used for preparing liquid glue, but also certain other acids, the most usual being nitric. Proceed as follows: Break up one pound of good common glue into small pieces and pour upon it one pint of water, taking care that the whole of the glue shall in turn be brought in contact with the water, so that it may become uniformly soft. Then melt in a covered vessel on a water-bath, cool it, and add 3 fl. oz. of nitric acid of spec. gr. 1·335, in small portions, stirring well after each addition. Finally, put it in bottles. This glue will not gelatinize, and will retain its full adhesive power. It is, however, very acid, and cannot be used where acids would be injurious. If the nitric acid were to be neutralized, the glue solution would lose most of its adhesiveness. If oxalic acid is used in place of nitric, and a gentle heat be employed while the acid acts on the glue, the result is the same as with nitric, so far as adhesiveness is concerned. But there is this difference, that the oxalic acid may be removed by lime, and the residuary liquid glue will be found to have lost none of its adhesive property.

Sealing Wax.—The basis of all the different varieties of sealing-wax is shellac and Venice turpentine. Fine red sealing-wax is made as follows: Melt cautiously 4 oz. of very pale shellac in a bright copper pan over a clean charcoal fire to the lowest temperature of heat that will be necessary to melt it. When the shellac is melted stir it into $1\frac{1}{4}$ oz. of warmed Venice turpentine, and then 3 oz. of vermilion. The heat should be so maintained as to be just sufficient to permit of the thorough incorporation of the constituents. When this latter has been effected the fluid mass is discharged into metallic moulds and allowed to cool. To produce the beautiful polished surface of the sealing-wax of commerce the sticks are removed from the moulds in which they are cast and placed in other moulds of polished steel, which may be engraved with the name or brand of maker, and with any desired ornamentation. The steel moulds are heated just enough to melt the surface of the sealing-wax, and the sticks thus acquire, when cooled, a beautiful glossy surface. Different colours are obtained by the incorporation of suitable colours instead of the vermilion as above. To perfume sealing-wax, add to the ingredients, when somewhat soft, and thoroughly incorporate with them, one per cent. of liquid storax or balsam of Peru, but a little musk essence or ambergris will answer the same purpose.

An Elastic Mucilage.—To 20 parts of alcohol add 1 part of salicylic acid, 3 parts of soft soap, and 3 parts of glycerine. Shake well, and then add a mucilage made of 93 parts of gum arabic and 180 parts of water. This is said to keep well and to be thoroughly elastic.

Liquefiable Sealing-Wax.—Heat two parts of Venetian turpentine and dissolve therein four parts white shellac; remove the heat, allow to cool somewhat, and add 10 parts 96 per cent. alcohol. Rub five parts cinnabar into a paste with alcohol and add this to the mixture, stirring constantly during the addition. The whole is put into convenient bottles, and whenever it is desired to use the wax the preparation can be made perfectly fluid by immersing the bottles in warm water and shaking.

Recipe for a Glue that will make Leather adhere to Iron.—Add about five per cent. of glycerine to good glue, and just before using add five per cent. extract of oak bark or tannic acid. Use thick and hot.

Paste for Mounting Drawings or Photographs.—A mixture of gum tragacanth and gum arabic forms with water a thinner mucilage than either of these two gums alone. Rice flour is said to make an excellent paste for fine paper work. A solution of two ounces and a half of gum arabic in two quarts of warm water is thickened to a paste with wheat flour; to this is added a solution of alum and sugar of lead, one ounce and a half each, in water. The mixture is heated and stirred until about to boil, and then cooled. It may be thinned with a gum solution.

Moisture-proof Glue.—Dissolve sixteen ounces of glue in three pints of skim milk, and if desired still stronger, add powdered lime. For marine glue, heat moderately a mixture of india-rubber (one part by weight), mineral naphtha, or tar (two parts), and add twenty parts of lac in powder. Heat to a temperature of 120 degrees to use.

Diamond Cement.—Soak isinglass in water till it is soft; then dissolve it in the smallest possible quantity of proof spirit, by the aid of a gentle heat; in two ounces of this mixture dissolve ten grains of ammoniacum, and whilst still liquid add half a dram of mastic dissolved in three drams of rectified spirit; stir well together and put into small bottles. When required for use it must be liquefied by plunging into hot water and applied directly.

Cement Proof against Boiling Acids.—This may be made by a composition of india-rubber, tallow, lime, and red lead. The india-rubber must first be melted by a gentle heat, and then 6 to 8 per cent. by weight of tallow is added to the mixture while it is kept well stirred; next, dry slaked lime is applied until the fluid mass assumes a consistency similar to that of soft paste; lastly, 20 per cent. of red lead is added in order to make it harden and dry.

Cement for Leather or Cloth.—One pound of gutta percha, four ounces of india-rubber, two ounces of pitch, one ounce of shellac, and two ounces of oil. Melt altogether and use hot.

Mounting Labels on Cans.—Paper labels may be made to stick to tin by first brushing the tin over with hydrochloric acid.

Preserving Mucilage.—The best way to keep mucilage is to cork the bottle with an india-rubber stopper. The india-rubber will not stick to the glass as an ordinary cork does; it fits tightly, thus preventing access of air from decomposing the gum, and can readily be cleansed. Once used, an india-rubber cork will always be used in the mucilage bottle.

Cement for Envelopes.—Inviolable envelopes, long the desideratum of envelope makers and users, may be rendered thus by using a solution of cupric ammonia. The latter dissolves cellulose and other substances. If the envelope is moistened with the solution, the surface of the paper is to some extent disintegrated, and a joint is effected which, when dry, can be opened only by using some force.

Wafers.—Mix fine flour with the whites of eggs, isinglass, and a little yeast. Mingle the materials and beat them well together. Spread the latter, making thin with gum water, on even tin plates, and, after drying them on the stove, cut to required shape. The colours are imparted by using for *Red*, a little Brazil or vermilion; *Blue*, indigo or verditer; *Yellow*, turmeric, gamboge, or saffron.

Cement for Rubber and Metal.—Take pulverized shellac dissolved in ten times its weight of pure ammonia. In three days the mixture will be of the required consistency. The ammonia penetrates the rubber, and enables the shellac to take a firm hold, but as it all evaporates in time the rubber is immovably fastened to the metal, and neither gas nor water will remove it.

Preventing Dampness and Brittleness in Making Pasteboards.—Use gum shellac, three parts; caoutchouc (india-rubber), one part, by weight. Dissolve the rubber and shellac in separate vessels in ether free from alcohol, applying a gentle heat. When thoroughly dissolved mix the two solutions, and keep in a bottle tightly stoppered.

To Prevent Gum turning Sour.—Add a few drops of oil of cloves, or of alcohol, or any essential oil. Five or six drops to a quart of gum are sufficient.

A Recipe for Gumming.—Dissolve a pound of good gum arabic in three pints of cold water. Then add a table-spoonful of glycerine and two ounces of honey. Strain the mixture through flannel. The glycerine prevents the gummed labels cracking and curling up when dry. A sponge is the right thing to use—not a brush. If the mixture is to stand any time, a few drops of sulphuric acid will prevent its turning mouldy or losing strength.

Glue, Paste, or Mucilage.—The following formula is for making a liquid paste or glue from starch and acid. Place five pounds of potato starch in six pounds of water, and add a quarter of a pound of pure nitric acid. Keep it in a warm place, stirring frequently for forty-eight hours. Then boil the mixture until it forms a thick and translucent substance. Dilute with water, if necessary, and filter through a thick cloth. Another paste is made from sugar and gum arabic. Dissolve five pounds of gum arabic and one pound of sugar in five pounds of water, add one ounce of nitric acid, and heat to boiling; then mix the above with the starch paste. The resultant paste is liquid, does not mould, and dries on paper with a gloss. It is useful for labels, wrappers, and fine bookbinders' use.

Dextrine as a Substitute for Gum on Envelopes.—This can be procured of any chemist or drysalter, and is prepared for use by mixing with boiling water until it assumes the required consistency. It should only be made in quantities sufficient for immediate use, because it is somewhat difficult to re-melt.

A Durable Paste.—To make paste that will keep a year, dissolve a teaspoonful of alum in a quart of warm water. When cold, stir in as much flour as will make it of the consistency of thick cream, being particular to beat up all the lumps, stir in as much powdered resin as will stand on a sixpence, and pour in a few drops of oil of cloves to give it a pleasant odour. Have on the fire a teacupful of boiling water; pour the flour mixture into it, stirring well all the time. In a few minutes it will be like mush. Pour into an earthen dish; let it cool; lay a cover on and put it in a cool place. When needed for use take a small portion and soften with warm water.

Another Liquid Glue.—Take some good strong glue and mix it with full proof whisky. Let it digest for three or four days and it will be ready for use.

Fluid Glue.—A good one ready at all times for instant use is a most useful article of stock. To make such a glue, melt three pounds of glue in a quart of water, and then drop in gradually a small quantity of nitric acid. When this ingredient is added, the mixture is to be taken from the fire and allowed to cool. Glue so prepared has been kept in an open bottle for two years.

Cement for Iron.—Six parts of sulphur, six of white lead, and one of borax, thoroughly mixed and wetted with strong sulphuric acid, make a strong cement for connecting iron work.

Another Method for Pasting Labels on Metal.—It is well known that paper pasted, gummed, or glued on to metal, especially if it has a bright surface, usually comes off on the slightest provocation, leaving the adhesive material on the back of the paper with a surface bright and slippery as ice. To overcome this it is suggested that the metal be first dipped into a strong and hot solution of washing-soda, afterwards scrubbing perfectly dry with a clean rag. Onion juice is then to be applied to the surface of the metal, and the label pasted and fixed in the ordinary way. It is said to be almost impossible to separate paper and metal thus joined.

To Make Wall-Paper Stick.—To make paper stick to a wall that has been whitewashed, wash in vinegar or saleratus water.

To Preserve Paste.—The decomposition of paste may be prevented by adding to it a small quantity of carbolic acid. It will not then become offensive, as it often does when kept for several days, or when successive layers of paper are put on with paste.

Mouth Glue is made by dissolving 1 lb. of fine glue or gelatine in water, and adding $\frac{1}{2}$ lb. of brown sugar, boiling the whole until it is sufficiently thick to become solid on cooling. Pour into moulds, or on a slightly greased slab, and cut into pieces when cool.

Glue.—A glue ready for use is made by adding to any quantity of glue common whisky, instead of water. Put both together in a bottle, cork it tight, and set it for three or four days, when it will be fit for use without the application of heat. Glue thus prepared will, it is stated, keep for years; at all times fit for use, except in very cold weather, when it should be set in warm water before using. To obviate the difficulty of the stopper getting tight by the glue drying in the mouth of the bottle, use a tin vessel with the cover fitting tight on the outside to prevent the escape of the spirit by evaporation. A strong solution of isinglass made in the same manner is an excellent cement for leather.

Recipe for Sticking Writing Paper Pads Together.—A quarter of an ounce crude gutta percha; dissolve in bisulphate of carbon to the consistency of mucilage. Apply with a brush to the edges of the paper where required.

Stickfast Mucilage.—The following is said to be a good, well-keeping preparation: Gum arabic, 8 ounces; water, sufficient; sulphate of cinchona, 24 grains; oil of cloves, 3 drops; glycerine, 4 drams; alcohol, 1 dram. Dissolve the gum in enough water to form a mucilage of proper thickness; add to it the glycerine, and finally the oil of cloves and cinchona sulphate dissolved in the alcohol.

Transparent Cement.—Mix in a well-stoppered bottle 10 drams of chloroform with $12\frac{1}{2}$ drams of non-vulcanized caoutchouc in small pieces. The solution is easily effected; when finished, add $2\frac{1}{2}$ drams of mastic and let the whole macerate from eight to ten days, but without heat. A perfectly white and very adhesive cement is thus produced.

Dry Pocket Glue is made of twelve parts of good glue and five parts of sugar. The glue is boiled until it is entirely dissolved; the sugar is then put into the glue, and the mass is evaporated until it hardens on cooling. Lukewarm water melts it very readily, and it is excellent for use in causing paper to adhere firmly, cleanly, and without producing any disagreeable odour.

Insoluble Glue.—The addition of two per cent. of potassium bichromate to the water in which glue is dissolved, just prior to its use, and exposing the glued article to light, will make it insoluble in hot water.

Cement Stopping for Wood.—Convert a quantity of sawdust, of the same kind of wood as that of the work, into pulp, by boiling and lengthened immersion in water. When quite soft and pulpy, strain off the water through a cloth, and squeeze the moisture from it; keep this for use, and when wanted mix a sufficient quantity of thin glue to make it into a paste; rub it well into the cracks, or fill the holes with it. When it is quite hard and dry, it may be cleaned off and finished. If the work has been carefully done, the patches will hardly be detected.

Flexible Compound for Paper Pads.—Use one part by weight of sugar, one part of linseed oil, four parts of glycerine, eight parts of glue or gelatine, a little aniline dye to give colour. Cover the glue or gelatine with water and soak one half hour or until soft. Pour off all the water and melt by heating in a pail or basin placed in another kettle containing boiling water; a common glue-pot will do. After melting, put in the sugar and glycerine, remembering to stir well; add the dose and then stir in the oil thoroughly. Green and carmine are good colours, and when both are used a handsome purple will be obtained.

Mucilage for Pasteboard.—Melt together equal parts of starch and gutta percha. To nine parts of this add three parts of boiled oil, and one-fifth part of litharge. Continue the heat and stir until a thorough union of the ingredients is effected. Apply the mixture hot or somewhat cooled, and thinned with a small quantity of benzole or turpentine oil.

To Prevent Glue turning Sour.—Salicylic acid will prevent bookbinders' glue from turning sour.

To Preserve Paste.—To keep flour paste from souring, add half a pint of turpentine to a bucketful of paste, after the latter is boiled and nearly, but not quite, cooled.

Gum for Backing Labels.—Take any quantity of clear pure dextrine and mix it with boiling water until it assumes the consistency of ordinary mucilage. Apply thinly, with a full-bodied, evenly-made, and wide camel-hair brush. The paper should not be too thin or unsized. The preparation will dry quickly, and adhere when slightly wet. No more of the dextrine should be mixed at one time than can be used at once, as it cannot be remelted easily.

Test for Bookbinders' Glue.—Glue that will stand damp atmosphere is a desideratum among bookbinders. Few know how to judge of quality except by the price they pay. Price is no criterion; nor is colour. The adhesive and lasting qualities of glue depend upon the raw material from which it is made; for if that is inferior and not well cleansed, the glue will have to be unduly charged with alum or other antiseptic to make it keep during drying. Weathered glue is that which has experienced unfavourable weather while drying. To resist damp it should contain little saline matter. When buying the article, venture to apply the tongue; if it tastes salt or acid, reject it for any but the commonest purpose. This tasting will also bring out any bad smell the glue may possess. Another good test is to soak a weighed portion of dry glue in cold water for twenty-four hours, then dry again and weigh. The nearer it approaches its original weight the better it is.

Method of Gumming.—The following is the rule in gumming by label-printing firms. The principal thing to be observed is to prevent the sheets from curling while drying; to do this, the gum must be invariably dissolved in *cold* water. To make gum for thick "drapers'" labels, dissolve one pound of gum arabic, at 6*d*. per lb., in one quart of cold water, and strain through flannel. To make gum for chemists' labels, take one pound of gum arabic, at 6*d*. per lb., and dissolve it in three pints of cold water; add one tablespoonful of glycerine and two ounces of honey. Strain through flannel, and apply with, say, a 5*s*. piece of Turkey sponge, which will last in constant use three or four months: common sponge goes to pieces almost directly. Lay the sheet to be gummed on a flat board, and gum over evenly. Then lay the sheet, gummed side up, on another thin flat board, and place it in the board-rack to dry, and the sheet will not curl. The board-racks used in London generally hold seventy boards each; they are simply made, and not expensive, being similar in construction to a printer's case-rack; but the fillets to hold the boards (which are very thin) are only one quarter the thickness, and of course are placed together as closely as possible, that is to say, as is consistent with the boards working freely in and out.

Paste without Boiling.—This patent is for a paste, consisting of flour with alkali. If the flour be mixed with an alkali in specified proportions in the form of powder a compound is formed which, when mixed with water, will soon assume the consistency of a paste and will become soluble in water. The action of the alkali on the flour bursts the starch cells and digests or dissolves it, increasing its bulk and reducing it to a paste, which may be thinned by the addition of water or thickened by the addition of more of the alkali and flour. This compound will be sold as a powder to be mixed with water by the user. Paste compounded in this way is apt to discolour paper, especially when the paper is coloured or tinted. It is proposed, therefore, to use as a neutralizing agent ammonium sulphate [$(NH_4)_2SO_4$] or other similar unstable compound, which, when exposed to the alkaline solution,

will cause a double decomposition, whereby potassium sulphate or sodium sulphate, as the case may be, and ammonium hydrate are produced. The alkali quickly digests the flour, in a few minutes swelling it up and reducing it into a paste, which gradually grows thicker in consistency. At the same time, but more slowly, the ammonium sulphate acts upon the strong alkali, and a double decomposition takes place, which results in neutral potassium sulphate or sodium sulphate, as the case may be, and ammonium hydrate, which latter passes off slowly as a gas, thereby gradually decreasing the alkalinity of the mixture. This reaction is slow, and therefore the ammonium sulphate does not neutralize the strong alkali until after the flour has been completely digested. After the completion of this process, the paste, if not of the desired consistency, may be made more fluid or thicker by the addition of water or of the paste compound. After the paste is mixed it is free from lumps, and it will remain in condition for use for several weeks without spoiling. As a powder, it may be preserved without change indefinitely if kept in a dry place, and the fact that a given quantity of the powder will make about eight times its own volume of paste makes it easy to handle commercially and to transport.

Marine Glue.—Liquid marine glue is a compound prepared by digesting one part of finely-cut caoutchouc, during about ten to fourteen days, with ten parts of oil of turpentine at a gentle heat and under frequent agitation. This liquid is used for rendering wood, ropes, tissues, etc., waterproof, by applying one or more coats. What is usually known as "Marine Glue," without the distinction "liquid" or "solid," is prepared in exactly the same way, and then adding to the solution two parts of shellac—or better, of asphalt—for every one part of caoutchouc employed. The mixture is heated in an iron pot until it has become completely homogeneous, and does not give off volatile vapours. During the heating the mass must be carefully stirred, and the temperature should not be allowed to exceed 140° C. (284° F.). It is then poured out into capsules. For use, one of the latter is heated in a water-bath until the contents are melted, when it is transferred to a sand-bath and

cautiously heated to nearly 140° C. The edges to be cemented together must be warmed, coated with a thin layer of the marine glue, and then firmly stuck together.

WATERPROOF SHELLAC OR VARNISH.—A medium that will stick the edges of paper together may be made with a quarter of an ounce of crude gutta percha dissolved in carbon disulphide to the consistency of mucilage.

ARTIFICIAL DEXTRINE.—Two parts nitric acid to 300 parts of water, mix with 1,000 parts of dry starch. This mixture is then subjected to heat. It may also be produced by heating starch with diastase, a peculiar azotized substance contained in malt, which effects the conversion of starch, first into dextrine, then into grape sugar.

STEREOTYPING AND ELECTRO-TYPING

PROGRESS IN STEREOTYPING.—A statement of the changes made in newspaper stereotyping during the past ten years will be interesting. A better matrix than was formerly used, one adapted to the fine screen of the present-day half-tone; a rotary matrix drier, and the Autoplate, constitute the new things introduced. To the new matrix principally should go the credit of making it possible to illustrate newspapers with high-grade photographic reproductions, and the rotary matrix drier should be credited with shortening the time between closing the forme and making the first plate; while of the Autoplate many flattering things are said by those who use it. In these days, when a newspaper's work requires many presses for its production, and its requirements are of such a nature that every edition must not only be started, but completed at the earliest possible moment, an increase from one plate a minute to between four and five plates a minute in the productivity of a matrix is of the utmost importance, which alone would have justified the Autoplate. In addition to the saving of time, other important gains have been made by the use of the Autoplate. Experiment has shown the practicability of an eight-roll press, and it may be assumed that this machine, which requires 128 plates to cover its cylinders, will soon come into general use.

STEREOTYPE METAL.—Printers should know that to make stereo metal they should melt together old types and grocers' tea-chest lead, using 14 lb. of the former to 6 lb. of the latter. It is preferable to melt the type and the tea-

lead separately, and mix them when molten. To prevent any smoke arising from the melting of tea-lead, melt it over an ordinary fireplace, for the purpose of cleansing it, which can be done by throwing in an ordinary piece of tallow about the size of a nut, and stir it briskly with the ladle, when the impurities will rise to the surface and can be skimmed off. About 12 per cent. of antimony is sufficient to mix with lead for stereotype metal, and will make it quite hard enough without the addition of tin.

An American Stereotype Metal.—This is compounded thus: 100 lb. good lead, 16 lb. antimony, 4 lb. block tin. The quality of stereotype metal may be tested if required without analysis by pouring melted metal on an iron surface. If, in cooling, it becomes a deep bright steel colour, it may safely be inferred that the metal is good. Or if, in cutting the surface with a graver, it seems grainy or gritty as the instrument is passing over it, it may as safely be adjudged sufficiently hard. It is absolutely essential that the metal should be of the proper consistency, because if too hard it is likely to break on the press; if too soft, to mash. It is difficult, if not impossible, to apply an absolute test except by analysis.

An Alloy for Stereotyping and Electrotyping Metals.—This alloy for paper process consists of 88 per cent. of lead and 12 per cent. of antimony. A metal for plaster process consists of 82 per cent. of lead and 18 per cent. antimony, while the alloy for electrotype backing metal usually is much lower and consists of 4 per cent. tin, 91 per cent. lead, 5 per cent. antimony.

Mounting Stereo Plates.—For fixing stereo plates on type-high stereo cores, thus saving the expense of the old wood blocks and the labour in fixing, the following plan comes from across the Atlantic: The bed is a plain iron surface of any stereo-block height. It is placed on a steam-chest to be warmed, and is then coated by a brush with cement composed as follows: beeswax, 1 lb.; gum "ibus, 1 lb.; Burgundy pitch, $\frac{1}{4}$ lb. It is then removed to an iron table to cool. When quite cold, the stereo plates are placed

on the dry cement and adjusted. To do this accurately, a light wooden frame is laid over the iron bed, with cross threads stretched at proper intervals to mark the margin. The iron bed is again pushed on the steam-chest, and as soon as the cement is melted, the bed is shunted on to the bed of a press. Loose sheets are laid over the plates to soften the impression, and the table is run under the platen. Pressure is applied till the cement is cold, and the forme is ready for the machine. The plates are got off with a stout knife, or melted off.

Sharp Stereo Plates.—The French obtain very sharp plates in the paper process by using a compound as follows: 1 kilogramme paste made of starch, 1 kilogramme kaolin (china clay), and 10 grammes yellow dextrine. These are well mixed and passed through a hair-sieve or fine muslin. After standing for about two hours the composition is ready for use. The spreading of this mixture is said to be more difficult than of that in ordinary use, but the sharpness of the matrices obtained more than compensate for it.

Stereotype Moulds.—To make casts or moulds of plaster of Paris from metal types, without air bubbles or picks, as they are called, use the finest and purest plaster of Paris obtainable. When filling a mould, beat up the requisite quantity of cream quickly and carefully avoid making it too thick. In pouring this in, use a good camel-hair brush to displace air bubbles; a mere surface cover of this thin cream is all that is requisite. While doing this, have ready the thicker plaster, of the consistency of light syrup, and fill up the mould at once. In about twenty minutes open the mould, if the plaster is pure and has been properly mixed. If too much oil is not put on the type, and the brush is used properly, it will result in clear, sharp moulds.

Moulds and Matrices for Stereotype Plates.—A new invention consists of a dry method in the manufacture of moulds. The mould is of two parts, a facing and a backing. The face is composed of a piece of muslin covered with a sheet of tissue paper; the muslin is soaked with, and

the paper (when more than one sheet is used) is pasted with, a composition which will keep the muslin in a flexible state, prevent the paper drying hard before use, render it sensitive to moisture, prevent contraction on application of heat, and harden the facing when heated. The composition used for this purpose is formed of glycerine and starch, with or without a small quantity of common salt, suitable proportions of which are about 6 oz. starch, 1 oz. glycerine, and 20 gr. salt. The backing consists of a dry, thick sheet of soft paper—blotting paper, felt, or other suitable substance—capable of receiving and retaining an impression. The facing composed of the muslin and tissue paper is dried cold, and when used should only contain sufficient moisture to render the paper slightly soft. The muslin should be kept firm and wiped with a sponge containing the composition. In taking the matrix the facing is placed upon the type, paper side downwards, and the backing of dry paper is placed upon it. They are then covered with woollen or india-rubber blanketing, and rolled or pressed. The matrix is claimed to be at once formed, and when removed from the type has simply to be warmed through. The heat quickly sets the composition and hardens the face.

Moulds made by Roller Machines.—The cause of trouble when moulds are made by this method is apparently in the paste and an insufficient weight of paper. The following paste recipe has been used for years with good results: 15 lb. white dextrine, 10 lb. bolted whiting, 5 lb. Oswego starch in 22 quarts of water. Stir with the hands until all lumps have disappeared, then cook in a steam-jacketed kettle. Boil the paste slowly with constant stirring for ten or fifteen minutes. In warm weather add a tablespoonful of carbolic acid to prevent fermentation. If a smaller quantity of paste is desired, observe the same proportions in making it. Dealers in stereo-paper, for the roller process of stereotyping, supply a heavy white blotter for the body of the matrix and a thin red blotter. The matrix should be made up with one heavy white blotter, two thin red blotters, and three or four tissues. With this paste and paper there should be no difficulty in turning out satisfactory work.

Mice-Proof Stereo Paper Moulds.—By reason of the paste used for sticking together the different sheets, it is found that paper matrices or moulds are frequently injured by mice. Risks of this nature can be obviated by mixing with the paste some bitter substance, picric acid being especially recommended. Mice will never touch paste thus treated.

Celluloid Stereotypes.—Celluloid is coming into use for stereotypes. The engraving or forme of type to be stereotyped is first used to make a fine paper matrix, just as if a common metal stereotype was to be made. Then this matrix is placed in a forme, and a sheet of celluloid laid over it. The two are put in a hydraulic press, with a temperature of 300° Fahr., the celluloid is pressed into the matrix at a pressure of 4,000 lb. to the square inch, and the thing is done. When taken out and cooled the celluloid plate is an exact counterpart of the original forme, and when cemented to a suitable wood backing it is good for four times as many impressions as a copper stereotype. Besides, it is not easily damaged. Celluloid is also used for facing wood type by laying a thin sheet of celluloid over the face of a large block of wood, and the two are placed in a hot press. When they come out the celluloid has been forced into the pores of the wood an eighth of an inch, and has a surface as smooth as metal type. The block is then cut up into wood type by the ordinary wood-type machine, or it may be sold to wood engravers, who find it equal to box-wood.

Another Method.—Celluloid stereotypes are made by placing the dry mould and the celluloid of which the stereotype is to be made, in a frame provided with a spring, which will keep the celluloid under constant pressure. The whole is then immersed in hot oil until the celluloid is sufficiently softened to be forced into the mould by the spring.

Instantaneous Stereotyping.—What appears to be an important improvement in stereotyping is a recent invention which consists of a special matrix, made from cotton and asbestos, with a face of stereotypers' ordinary cream tissue, and a backing of wood-pulp. With this matrix no heating

of the type is necessary, as it can be dried, from cold type, in from half a minute to a minute and a half. Large open spaces need not be filled in or backed, and a large number of casts can be made from one matrix. The matrix can be used a year or more after being made. From an examination of several matrices made by this "cold-type process," it will be seen that some important advantages have been gained. The most important is that of time—doing away almost entirely with the twelve or fifteen minutes required to dry the matrix under the present system. The type, not being heated, will not become soft on the bottom, hence a less frequent renewal of body founts will be required. The absence of heat will also allow woodcuts to be used, the same as in stereotyping from plaster.

Cold Stereotyping.—A new method is said to have been invented by a stereotyper. Its sole novelty consists in the mode of drying the damp matrix as taken from the type. The matrix is laid with its face upon a fine wire gauze, which is fixed in a frame, the edges of which adapt themselves to the form of the edges of the matrix. A second frame is then put upon the first one, and the two fastened together by cramps; the edges of the matrix are consequently fixed firmly between two frames, its face resting upon the wire gauze. The matrix is then dried by simply placing it in a chamber by the side of the melting-pot, heated by the escaping gases of combustion of the latter.

Stereotyping Music.—The principal London music printers prefer plaster stereos to electros of music formes. The reason is that the pressure, perhaps as much as fifty tons, on the wax to get the mould has a tendency to spread out the types, and to cause bad joinings. The plaster is merely poured on, and in drying the mould contracts, which tends to bring lines together. Some firms, however, work from an electro taken from a plaster stereo, and in this way obtain the advantages of both processes.

A Stereotypers' Paste.—Take 5 oz. of flour, 7 oz. of white starch, a large tablespoonful of powdered alum, and 4 quarts of water. Put the flour, starch, and alum into a

saucepan, and mix with a little of the water, cold, until the whole becomes of the consistency of thick cream. Then gradually add the remainder of the water, stirring well meanwhile to prevent lumps. Put the mixture over the fire and stir until it boils; then let it stand until quite cold, when it should look like jelly. When you are ready for work add Spanish whiting, the mixture not to be too stiff to spread readily with the paste brush. Put through a fine wire sieve with a stiff brush, and it is ready for use.

Stereotypers' Improved Paste.—This is composed of the following ingredients: Water, flour, starch, gum arabic, alum, and whiting. Use the best flour and starch. These foregoing articles, excepting the whiting, are thoroughly mixed, and heated by steam. When the mass is thoroughly homogeneous, sufficient whiting is added to give it stiffness.

Stereotyping Millboard.—A stereotyping millboard has been introduced which dispenses with preparing and preserving paste, and making the flong. When the millboard is to be used it is put for five minutes in cold water, and then placed between a layer of blotting paper to take off all the water on the outside. It is then laid on the forme and beaten or pressed, where it will dry, giving a sharp impression, within five or six minutes.

Stereotyping Zinc Etchings.—A very wet mould, free from creases, is recommended. Those who use ready-made flong should let it lie twenty minutes in cold water, carefully dry between blotting-paper, then beat in. Those who prepare their own matrices will mix the matrix powder or chalk with cold water to the consistency of milk, and spread thickly on the paper, beating continually but lightly with a soft brush. All zinc etchings must be thoroughly washed with paraffin before stereotyping, and also woodcuts which are to be stereotyped. Old woodcuts and etchings which are covered with hard, dried ink must be laid face down in paraffin for at least half an hour, or the stereotype will not be a success.

Improved Stereo Core Blocks.—Objections have been made to the various plans of preparing wooden or other

cores for stereotype or electrotype blocks. These cores, when not covered by the metal, were liable to warp or swell from the water used in washing the formes. To overcome this a method of making a core has been suggested. The wood is placed over the casting-box and allowed to remain until heated, supports being driven into the ends at points previously marked. When a stereotype is to be made, the matrix is inserted in the casting-box as usual, and the core is put into position by means of the supports, two in the lower and one in the upper end of the box. All the pieces of box being in place, the upper support of the core is covered with stereotypers' paste, on the top side only, to prevent its melting when the hot metal is poured against it. In this way a stereotype is made and the core covered in one operation. Another method is pursued when a plate already cast is to be mounted on a block. First, it is backed in the usual manner, and is straightened or planed. Next, the face is laid against the bottom of the casting-box, the core is put on the back, and strips of tin-foil put around the edges for these strips to fuse as the metal is poured. Pieces of fusible metal—one, two, three, or four as required—just thick enough to fill the space between the core and the lid of the casting-box, are put on the back of the core; then, with the enclosing side and end bars set, the core is ready to receive the metal. If the plates are old, the edges around the outside of the core, where they are to fuse with the new metal, should be scraped clean and bright, and the strips of tin-foil applied as in new, bright plates. Blocks made thus have been found, after many tests, to be waterproof and unaffected by the air. They also require less metal than the old style partially enclosed cores, with ends and sides exposed to moisture.

The Correct Heat of Stereotype Metal.—Dip a piece of paper in the metal, and if it turns it black the metal is too hot, but if it turns the paper to a straw colour it is correct.

Hollow Stereotypes.—This trouble is by no means uncommon, for it is a source of anxiety to most stereotypers who have to deal with open pages of lettering or

ornamental work. The gradual hollowing action of the face results from the contraction of the paper packed into the whites, for the constant application of heat from the metal causes the whites to shrink inwards on to the lettering, making them "cup." Thinner moulds are advised for open work. Try one blotting, three tissues, one backing, well pasted, and do not pour metal at too great heat. Avoid packing whites with so much stuffing: piece the mould after baking to prevent the whites sinking in with the weight of metal. One can get padding to the required thickness or a piece of card just touched with glue to hold it in position. For this sort of work the mould is unnecessarily deep.

Some Defects in Stereotyping to be guarded against.—Plates are bevelled usually by a rule of thumb method, so they are any width within a "lead" or so, and the planing might be almost as well left alone, only the casting-boxes are not true. For instance, the casting-box is cold to start with, and metal is poured into it, with type-high gauges, to make it hot. These "heaters," so called, are put back into the metal-pot, or stood aside, if their going back would cool the metal too much. Thus the casting-box becomes hot enough to cast a plate in. The "mould" is laid on the box, the proper pica or other gauges laid in their places on its margin, the back of the box is lowered, the cross-piece is swung into its right place, the screw is turned with a spin, and afterwards by the operator's two hands, and the whole is then tilted and the metal poured in. The difference of shape, if any, of the casting-box, owing to its ever-varying temperature, will be hard to alter. As the box gets hotter its iron gets more pliable; and the screw referred to goes on to the middle of back of box, about as tightly as it can be twisted, and the space where the metal is to run in is reduced by this compression, and the plate is thinner there, and the metal cools most there and shrinks as much as it can, so the plate needs planing. If, instead of this screw, a bar was placed across on the "gib-and-cutter" principle, the mould and gauge would keep their places, the back would not be depressed, and the plate would be truer. With many planes

in use to-day, one can take three cuts off a plate without altering any part of the machine, or the "papers" under the plate. This should not be.

A Hint to Stereotypers.—Occasionally, when it is necessary for engraving purposes to run a type-metal plate in a plaster-of-Paris mould, the metal comes out punctured with numerous air and steam holes, not at all like the smooth surface of the plaster in which it has been cast. These undesirable results are caused by the molten metal bubbling like boiling water as soon as it touches the mould, then cooling and hardening full of cavities on the under side where it is intended for engraving. This objectionable result can be obviated by a few simple precautions. Warm the plaster mould, then fasten it face upward in a shallow cast-iron pan, plunge pan and all into a pot of type-metal, and keep it immersed until bubbles of air and steam are no longer given off. Then draw it out, permit it to cool, and separate the plate, and it will be found free from cavities and ready for planing and trimming.

How to Preserve Electrotypes.—When electrotypes are out of use and require to be stored, they should be kept in a dry place, and the surface of the plates oiled to prevent verdigris. When they become clogged with hard, dry ink, which the pick-brush and turps fail to remove, they may be cleaned and made equal to new in a few minutes by covering their surface with a little creosote, and afterwards brushing the surface with turps.

Nickelled Electrotypes.—There are now being produced a new species of nickelled electrotypes. The electric current is produced by a Gramme machine; the mould is of caoutchouc, and after being taken and blackleaded, is put in a bath of nickel, where the electric current coats it with a thin covering of that metal in a short time. The mould is then withdrawn from that bath and placed in one of copper solution, where it remains for some hours. Afterwards the cliché is subjected to the ordinary processes of backing and finishing, and it is then ready for use. These electros cost about $6\frac{1}{2}d.$ the square inch, and are of especial value where vermilion ink is used.

To Coat Electrotypes with Silver.—Take one part copper, five parts pure tin, to be granulated, not too fine, and mixed with water and cream of tartar into a paste; to each two hundred parts of the granulated alloy add one part oxide silver. The electro is then laid in it and boiled for a few minutes.

The Copper of Electrotypes.—Printers do not always know that there is a difference in the copper on electrotypes. The copper deposit made nowadays is not to be compared with the copper deposit made years ago. The slow process of depositing makes a better grade of copper than that deposited at the present day by a fast-depositing dynamo. The difference in the grade can be seen by the number of impressions which can be taken from a plate made years ago, and one made at the present time. By making fast deposits the copper is of an inferior grade, because it has a soft texture which the press will soon wear out. In other words, copper deposited by the slow process is hard, while that deposited by the fast-depositing dynamo is of a soft texture. By the old process the solution of copper was from 14 to 16 specific gravity strength. At the present day the solutions run from 18 to 21 degrees of gravity strength. The old solution carried an acid strength of from one to two degrees, while the present solution carries from three to five degrees. The acid dissolves the copper in the form of annodes, and thus hurries the work, hence the difference in the grade. By thoroughly testing old and new process plates one may readily see there is a great difference in deposition of copper. Half-tones deposited by the fast dynamo will not wear nearly as long as the originals, and the electrotyper is generally blamed for making poor electros, when in reality the electros are as good as can be made, but the copper is of an inferior grade and will not stand long runs.

Electrotyping Duplicate Copper or Steel Plates.—Copperplate printing has always been considered to be under a great disadvantage where either speed or large numbers of impressions were needed. This was owing to the tedious nature of the process of printing, or because

the plate so soon showed signs of wear. The constant rubbing and polishing of the plate before taking each impression tend steadily to obliterate the work of the engraver. To obviate these difficulties, the plan has been adopted of taking electrotypes from copper or steel plates, and coating the electrotype with a steel face. The details of the method adopted are briefly as follows: A mould is taken from the original plate in a specially prepared material, and with considerable care, necessitated by the work on copper plates being more fine and also more shallow. This mould is then placed in a battery, where it usually remains for two or three weeks, in order that the "shell" of copper may be considerably thicker than is required for "relief" work. The proper thickness of copper having been deposited in the mould, the shell is filed or ground flat on the back, and the face coated with a deposit of iron, a process commonly called steel facing. The electrotype plate is then ready for printing; and as the original plate remains perfectly uninjured, fresh electrotypes can be taken as often as may be required. By taking two or three wax moulds a corresponding number of electrotypes may be prepared simultaneously. As soon as the steel face wears off in the printing, which is readily detected by the colour of the copper becoming visible, the plate can be re-coated.

Electrotyping Handwriting.—To produce electrotypes or stereotypes of letters, signatures, ordinary written matter, drawings, or sketches, coat a smooth surface of glass or metal with a smooth thin layer of gelatine and let it dry. Then write or draw upon it with an ink containing chrome alum; allow it to dry exposed to light, and immerse the plate in water. Those parts of the surface not written upon will swell up and form a relief plate, while those parts which have been written upon with the chrome ink have become insoluble in water, after exposure to light. The relief may be transferred to plaster of Paris, and from this may be made a plate in type metal.

Roughness of the Shell in Electrotypes.—The roughness on a shell may be caused by too strong a current or an excess of acid in the solution. It may be remedied by

diluting the solution or reducing the current; also by agitating the solution, if the trouble is due to a strong current. Sometimes from the appearance of a shell it would seem that the solution needs more sulphate of copper and an agitator. An agitated solution will admit the use of a much stronger current than is practical with a quiet solution. The holes in the shell and the quality of the deposited copper indicate a lack of sulphate of copper. Blisters in the wax are sometimes caused by moisture, sometimes by the use of crocus, and sometimes by adulteration. Probably less trouble would be given with ozokerite.

Inserting Cuts in Electrotype Plates.—The method commonly employed is to back up the etching to the thickness of the book plate, then fit it into the plate and secure it by soldering. A patented process is as follows: A base or blank block is fitted under the etching to make it type-high, and having been properly trimmed to fit into the type forme the etching is removed and the base alone is locked up in the forme with the type. The removal of the etching is necessary in order that the type may be blackleaded to cause it freely to release from the moulding composition in the operation of moulding, it being preferable that the face of the etching should not be blackleaded. After blackleading the type forme, the etching, having had its back thoroughly cleaned, is replaced face upward on the base within the forme, with its face flush with the type, then, the surface of the moulding composition having been coated with plumbago, the forme is moulded in the usual way. When the mould is lifted from the forme, the etching will be found imbedded in the moulding composition, face inward. The mould containing the etching is then blackleaded preparatory to being placed in the electrotyping bath; but, before being placed in the bath, the exposed back of the etching should be freed from blacklead and scraped bright to ensure the incorporation of the electro-deposited metal with the back and edges of the etching, and in order that the metal may be deposited in a continuous sheet over the edges of the etching to the back thereof, and thus form a perfect union between the electrotype and the etching, so that when the shell is removed

from the mould it brings the etching with it, the two forming practically one plate, which, when freed from adhering wax or moulding composition, may be backed with composition metal and finished in the same manner as ordinary electrotype plates.

Cleaning New Electrotypes.—This is a recipe for cleaning electrotype casts after shells are backed up. Scrub the electros while hot with kerosene oil and powdered pumice stone. Then lay them in a shallow sink with inclined bottom and steam them out, using a steam hose without a nozzle. After this take them to the sawdust box and brush them thoroughly with clean, dry sawdust.

Purifying Metal.—Most printers consider electrotypes bad when they find that the shell peels off and soft spots appear in the face of the type or job. These defects are always annoying to the pressman, as it is impossible for him to bring up the places where the soft spots appear, as there is no metal backing the shell under the soft spot. This is nearly always owing to poor backing metal. Poor tin-foil very often causes soft spots, as it does not always properly adhere to the shell. In this case no metal could possibly run to the face of the work. Zinc or traces of copper are often found in electrotype metal. They will also cause trouble, as zinc makes the metal rotten or granular, while copper makes it hard; but this can be taken out by burning powdered sulphur in the metal-pot, stirring the metal continually as long as the sulphur is burning, then skim the metal, and the zinc and copper are gone. Zinc and copper become dross through copper burning up the sulphur. This is also good to clean the metal with, as it makes it run freely.

Detection of Zinc in Type or Stereo Metals.—Care must be taken in the mixing of lead and type metal, that there are no pieces of zinc in it. The least portion of zinc will spoil the whole of the other metal that is mixed with it. Zinc is of a bluish white colour; its hue is intermediate between that of lead and tin. It takes a much greater heat than lead does to bring it into fusion. Should any metal float on the top of the lead, do not try to mix it, but im-

mediately take it off with the ladle. Another test of zinc in type metal is obtained by plunging a red-hot poker into the metal when it is at the heat to scorch a piece of paper black. If the metal does not adhere to the poker it is free from zinc; if, on the contrary, metallic patches appear upon it, zinc is present.

Copper-plating on Zinc.—The use of cyanide baths for plating on zinc has the double disadvantage of being poisonous and expensive. A recent discovery has overcome the objections by rendering the cyanide bath unnecessary. This is accomplished by the use of an organic salt of copper, say a tartrate. Dissolve 126 grammes sulphate of copper (blue vitriol) in 2 litres of water: also 227 grammes tartrate of potash and 286 grammes crystallized carbonate of soda in 2 litres of water. On mixing the two solutions a light bluish-green precipitate of tartrate of copper is formed. It is thrown on a linen filter, and then dissolved in half a litre of caustic soda solution of 16° B., when it is ready for use. The coating obtained from this solution is very pliable, smooth, and coherent, with a fine surface, and acquires any desired thickness if left long enough in the bath. Other metals can be also employed for plating in the form of tartrates. Instead of tartrates, phosphates, oxalates, citrates, acetates and borates of metals can be used, so that it seems possible to dispense with cyanide baths.

Electrotypers' Moulding Wax.—The following proportions are generally used:

25 lb. pure commercial beeswax.
1 oz. white turpentine (lump).
$\frac{3}{4}$ lb. plumbago.

The wax must be melted and the others mixed in.

Removing Paraffin from Plates.—In electro foundries where paraffin is used for cleaning plates, the oil is speedily removed by immersing the plate in a bag of mahogany saw-dust. Nothing so readily acts on the paraffin and brightens the metal. This treatment, however, would probably not answer for movable type formes.

Use of a Wax-Shaver.—Most of the larger electrotype foundries are equipped with wax-shaving machines. They are chiefly valuable when used with power moulding-presses which have indicators to register the depth of impression. The shaved case being of uniform thickness and the proper depth of impression having been established and noted on the indicator, the operator may thereafter be guided entirely by the indicator, for if the press is stopped each time at the same reading, the impressions will obviously be all of the same depth. A shaved case is also preferable, because the "skin" is thereby removed from the case and with it all dust or dirt which may have collected thereon, or which, being in the wax, may have risen to the surface when poured in the case. Instances have been known where the wax-shaving machine has increased the moulders' output twenty-five per cent.

Taking Care of Wood Mounts.—All printers have more or less trouble with wood-mounted electros, stereos, and engraved plates. Metal bases have been found most satisfactory, but their expense is great. However, for small electros there is no doubt that metal bases are the real thing; on large electros the cost of metal bases is almost prohibitive. Most formes are still washed with lye and then rinsed with water, and this process is practically necessary if clean type is to be had. One such washing will occasionally spoil wood bases, and after a few times will make electros and half-tone blocks quite unsafe to use. Some time ago the idea was conceived of using oil to resist the action of the lye and water. At first the machine oil was used—squirting oil on the ends of the bases. This worked so well that it was decided to use the method regularly. A large common iron dripping-pan was obtained, and into this equal parts of boiled linseed oil and kerosene were put. The cuts need only be put in this oil a few minutes to saturate the wood thoroughly.

Mould for Casting Leads, Slugs, and Furniture.—It is not easy to cast leads and slugs perfectly in the ordinary way. It requires long and persistent practice to succeed. Much depends upon the manipulation of the

metal by the old process. The obstacles heretofore encountered are overcome by a device which enables any printer to make his own leads, slugs, and furniture at a very low cost. The leads and slugs made by type foundries are usually only fourteen inches long, but by this device they can be made three feet in length, if desired. This advantage will be readily appreciated by all printers. There is a great gain in having leads of various sizes and lengths always at hand ready for use. Heretofore, in different kinds of work, it has been necessary either to piece the leads or slugs or use reglet. This is no longer required, as leads and slugs of any length can now be cast. There is always more or less old, practically worthless type metal in every office, which may be melted and converted into leads, slugs, etc. It will then be worth the full price of new material, and a great saving will be effected. Leads, three feet in length, and of the thinnest kind, can be made with no more difficulty than in making nonpareil slugs. It is also capable of making any size metal furniture up to twelve ems pica. Two, four, and six line pica are as readily made as pica slugs. They are also easily cast bevelled for foot slugs, or with grooved edges to save metal in larger sizes. Changing from one size to another consumes no time, and where a fire is burning a ladle of old metal may be converted into dressed work in five minutes, or as soon as it can be melted, and less heat is required than by the old process. On the same principle, light stereotyping may be done with paper matrices. The output only provides for single column matter, and as long as may be desired up to three feet. Stereotyping is more complicated than slug making, but is very simple when moulds are prepared, as in the ordinary way. Metal rules and letters may be made from any sample on hand, and be multiplied at will, and in this way sorts for founts of wood type may be supplied.

Bronze-Powder of copper has proved to be a good conductor for galvanic matrices, instead of graphite. Bronzed matrices are said to work easier than those treated with graphite, and spots which will not take the precipitated copper may be immediately recognized when taken out of the bath.

A Composition for Mounting Plates.—The following is recommended for fixing electros on wood, etc. Dissolve common joiners' glue to a consistency of syrup, and add pure wood-ashes under constant stirring until the mixture has the appearance of varnish. The adhesive power of this composition is said to be very great, the addition of the ashes preventing the electros from parting from the wood even when washed with lye.

Another Method.—A good mastic for fixing stereotype plates on wood or metal is obtained by dissolving ordinary cobblers' wax until it is about the thickness of a syrup, then stirring in a sufficient quantity of wood-ash to make it into a kind of varnish.

Making Glue Stamps for Endorsing.—The glue stamp is made thus: Upon the type or block place several leaves of tin-foil; over this a piece of felt is placed and the whole pressed tightly. Loosen the press at once and take out the tin-foil matrix, which is now ready for use. Oil matrix slightly and surround with oiled reglets; then pour fluid glue mixed with a little roller composition over it. After it gets cool the layer of glue will loosen itself slightly from the matrix, and become sufficiently hard but still remain elastic. The glue used is carpenters'. During the first few days the glue may appear somewhat soft, but it soon becomes hard, and retains sufficient elasticity. This stamp prints in an excellent manner with ordinary printers' ink.

Matrices Blistering.—These blister where the paste is not sufficiently adhesive; or when, through carelessness, the paper is not thoroughly covered with paste; or when, after the mould is dried, it is allowed to become damp again. When paste is too thin, *i.e.*, contains too much water, the water is turned to steam by the heat, and blows or puffs off the tissue.

How Heat affects Type.—It is a fact that all kinds of type are not affected alike by heat. In most cases the type grows, or becomes elongated, when locked up tightly

in a chase and subjected to the heat of a steam-table. This is owing to the fact that the type metal expands more than the iron chase in which it is locked, and as the natural expansion of the type is restricted in a lateral direction by the chase, it expands in the only other way left—vertically. That this matter of expansion is more than a theory is shown when the forme is surrounded between the type and the chase by wooden strips. In such cases the strips, if examined after the forme comes off the steam-table, will be found to have been crushed by the pressure of the expanding type. Stereotype chases made of two-inch solid steel have been broken asunder by the same pressure. With regard to "shortening" effect of heat, no satisfactory explanation has been made. We simply know that it is so and suggest that a difference in the composition of the type metal may account for it. We know that leads and slugs or strips of stereotype metal will shrink every time they are heated, even when not subjected to pressure. It is a fact that the effect of heat is not the same on all makes of type, and it is probably due to a difference in composition of the metal. The only remedy, if the hot process of stereotyping is employed, is to use all possible care to protect the type by surrounding it with soft wooden strips to take the squeeze, and to subject it to no more heat than is necessary to dry the mould.

ALLOY WHICH EXPANDS ON COOLING.—Most metals and alloys shrink or contract on cooling. But an alloy which will expand on cooling may be made of lead nine parts, antimony two parts, bismuth one part. This alloy can be advantageously used to fill small holes and defects in iron castings.

NEW SOLDERING MIXTURE.—One has been found which is free from the defects of chloride of zinc. It is made by mixing one pound of lactic acid with one pound of glycerine and eight pounds of water. Chloride of zinc, so much used in soldering, has, besides its corrosive qualities, the drawback of being unwholesome when used for soldering the tins employed to can fruit, vegetables, and other foods.

The Making of Flong.—Lay down upon a smooth iron or stone surface a piece of stout brown paper. Paste the surface of this over equally. Lay a sheet of good blotting paper upon the pasted surface, and press it down with the hand. Paste this over, and then put another sheet of blotting paper on; smooth well, paste this over; then place a sheet of good tissue paper or copying paper upon the blotting paper. Press it well down again, paste over, lay another sheet of tissue on the last, and smooth the whole carefully. Some pass a small steel roller over the flong to incorporate it more together and give it greater firmness. Flong may be had ready prepared; or it may be made with Nicholson's paste in the following manner: Paste a sheet of thick blotting paper evenly with the prepared composition and lay upon it a sheet of tissue. Turn the sheet and paste the blotting paper again, and lay upon it a sheet of thin demy paper. Turn again and paste the tissue side, and lay down a second tissue. Paste again and lay down a third tissue. This flong must not be immersed in *hot* water.

LITHOGRAPHY

PREPARING LITHO STONES FOR FINE ENGRAVING WORK.—The polish of a lithographic stone is enhanced by rubbing on with a piece of flannel dilute gum arabic and oxalic acid until thoroughly dry, but it is doubtful if the use of the acid is not prejudicial to the excellence of the engravings if they are to be preserved for many years. The following process is one recommended. After the stone has been cleanly polished it is coated over with a caustic solution of gum, which, when dry, is carefully washed off. The stone is then rubbed off with so-called lead paper and fine emery and water for a few minutes, whereby the excess of roughness is removed from the surface. After this is washed off again the surface is polished with a pad and a small quantity of tin ash and brimstone with some water, and it will soon receive the most perfect gloss. The stone is washed off and can be stored away until needed. Stones polished in this manner, on account of their great smoothness, retain just as little colour as copper plates, and the gummy preparation keeps them clean as well as oxalic acid would do, without possessing the latter's detrimental properties.

PREPARING METAL PRINTING PLATES.—This relates to the preparation of plates of aluminium or zinc for lithographic printing. The plate is first washed with a solution of nitroso-nitric oxide, then with distilled water, and afterwards with a mixture of distilled water, sulphate of aluminium and ammonium, oxide of calcium, sulphate of zinc or aluminium, nitroso-nitric oxide, and hydrofluoric acid. If for crayon drawings, the plate is grained by sand blast before treating with the last mixture. After the

drawing or design is on the plate, it is treated with an etching solution of phosphoric acid, chromic acid, tannic acid, and carbolic acid in water, mixed with gum arabic. When a higher relief for lithographic or letterpress printing is required, the drawing on the plate, before etching, is washed off with a mixture of asphaltum and turpentine, rolled up strong in ink, and dusted with resin. To prepare the plates for a new drawing, the ink and colour are removed with turpentine; the plate is then washed with oxide of potassium, and treated with the bath first described.

Hints for Lithographic Printers.—Lithographic printing requires great experience and long practice; but a few theoretical instructions are here given, which will give the printer the necessary practice very quickly. A good impression is obtained when a printer makes a clear, sharp, bright impression from a drawing or transfer as the work is on the stone. Some very good printers make even a better impression than the work done by the artist or transferrer. Those who do not understand this will say it is impossible; but it is not. A good printer handles his roller in such a manner that he is able to deepen the colour on one part of the drawing and lighten it up on another. When commencing to print on a good drawing or transfer, use a regular medium ink, neither too stiff nor too thin, and note the following: Put on a pressure of about twelve pounds with the hands on the roller, weight of roller not included; and observe that bearing heavier on the roller fills up the work, while bearing lighter on it takes ink off the stone or drawing. Light pressure gives only a little ink to work on the stone, and no pressure at all with roller takes some ink away that has already been applied. Slow rolling clogs the work on the stone. Quick rolling takes the ink and work off the stone. Slow rolling and heavy pressure on the roller give the work more strength. In doing this, use only a little ink on the roller, and remember this. When everything is in good order, this manipulation is the best. Quick rolling and light pressure on roller sharpen filled-up work without other help than the roller. If the work is very closely drawn,

use a stiff ink. If the work is very weak on the stone, use a thinner ink, rolling slowly and with medium pressure. In the summer, when the stones are warm, use only stiff ink; thin ink in a warm temperature fills up the work. Cold stones are still more dangerous. On a cold stone use thin ink, but even then the work comes off the stone at times. When a stone dries too quickly, put a little glycerine into the damping water; even a little salt would not hurt it. Transferrers should not do this, because this is only said for printers on hand or steam presses.

Dry Printing by Lithography.—A development has been made in a method of printing from a litho plate or stone without any damping. Such result is promised by use of a special ink, or rather of a patented varnish to be worked into the ink, the action being such that damping of the stone, platen, or roller between each rolling-up is avoided. It is said that the stone or plate can be rolled up, printed off, rolled up again, and so on, in a dry condition without the ink "catching" anywhere on the design. From some particulars obtained, in addition to glycerine and varnish, it appears that soda, tartar, and turpentine are added to the ink to be used (all embodied in the material supplied)—soda to ensure quick drying, tartar to keep edges and fine lines open and sharp, turpentine to lend the necessary softness. Printed specimens have been seen which are undoubtedly satisfactory, but it is a question whether the addition of these substances to an ink may not set up some chemical action tending to destroy its colour, permanency, or working qualities. Various attempts have been made to do this before, the processes utilizing gall, glycerine and varnish to be mixed with the colour, whilst the roller had to be damped with salt and glycerine. As a result the prints dried very slowly and lacked sharpness.

Imitating Lithographing on Celluloid.—Fasten the printed sheets to the transparent celluloid with a varnish made up of one part gum shellac, one part camphor, and four parts alcohol; dissolve and use very thin, placing sheets under reasonable pressure.

THE SIZES AND WEIGHTS OF LITHOGRAPHIC STONES.

Printing Surface.	Size of Stone in inches.	Average weight in pounds.
Demy 8vo	9 × 7	13
Imperial 8vo	12 × 10	24
Demy 4to	14 × 10	27
Royal 4to	14 × 11	32
Crown Folio	16 × 12	43
Large Post Folio	17 × 11	42
Imperial 4to	17 × 13	49
Demy Folio	18 × 12	50
Foolscap	18 × 14	58
Half Royal	20 × 13	70
Crown	21 × 15	85
Half Imperial	22 × 18	106
Large Post	24 × 16	125
Demy	24 × 18	130
Royal	26 × 20	165
Elephant	28 × 20	178
Double Crown	30 × 20	191
Imperial	32 × 22	224
Double Demy	36 × 24	294
Double Royal	40 × 28	394
Quad Crown	40 × 30	422
Double Elephant	42 × 28	414
Double Imperial	43 × 33	516
Quad Demy	48 × 36	648
Quad Royal	54 × 40	834
Quad Double Crown	60 × 40	900
Quad Imperial	62 × 42	1016

TO REMOVE ASPHALT POWDER.—The very fine particles of powdered asphaltum which settle between the work must be removed by rubbing over the stone a cotton pad charged with talcum. The more perfectly this dusting and cleaning is done the more perfect the melting will be at the edges, producing sharp lines after etching.

Even Temperature in the Press-room.—The need of the proper degree of warmth in the press-room should be emphasized as essential to good work. Although in summer the lithographic stone is unfavourably affected by too much heat, it is just as bad in winter, when the lines on a cold stone are apt to vanish through the contracting effect of the cold upon the grease.

To Prevent Freshly-Printed Sheets Sticking together.—Use as much thin varnish in the ink as may be needed to obtain the lightest possible tint, without smearing the work on the stone, adding a trifle of silicate basic potassa to the ink; but care must be taken that it is done drop by drop, as it has a very strong effect, and will make the ink as stiff and strong as if it had been mixed with the strongest varnish.

Fading of Red Lithographic Inks.—It is a fact that red, especially cardinal lake, being an aniline colour, will fade, as will also the usual compositions of cardinal lake and vermilion. To obviate this difficulty, when a fine bright red is required, by mixing a little lemon yellow, say one-fiftieth part, with the cardinal lake and vermilion, a much finer and brighter red is produced, and one which will not fade.

Lithographers' Tushe.—Artists and printers using the air-brush find that the dots blown upon the stone are of so fine a texture that they are unable to etch and prepare them safely, and ask for a "tushe" for this process which will stand a stronger etching. A German recipe, by which artists will be enabled to use the air-brush to still greater advantage, is as follows: Take 10 parts of shellac, 10 of beeswax, 8 of Castile soap, 6 of dragon's blood, 6 of tallow, and 10 of palm oil—total, 50 parts. Wax, soap, tallow, and palm oil are put on the fire in an iron pot large enough to hold at least ten times the quantity of these ingredients. The fire should be slow-burning, but as soon as the ingredients are hot enough light the evaporating gases and burn for a few minutes. Hold a cover ready in one hand, and cover the pot after about two minutes. While burning add the dragon's blood and

shellac and stir well. When these are all well melted and mixed, let them cool off. Form the mass at the right time into balls or sticks, and in using the tushe melt one part of tushe with 10 parts of distilled water in a boiling condition. This tushe, if kept air-tight, will last in a liquid form for some months, and will stand a very strong etching.

Tympans for Litho Presses.—Tympan leather is largely used by lithographic printers. The hides are sometimes dressed whole, being usually hides set apart for that purpose; shaved hides may be used if they run stout. The hides should average from twenty-five to thirty-five pounds each. A writer says that, in practice, he has found it best to cut the bellies off in the rough state, that is, before they are soaked down. Great care must be taken in selecting the hides for tympans, as they must be quite free from flaws or cuts on either side. Select good grown hides, as this gives the advantage of cutting large-sized tympans, and the veins are easily got out without reducing the substance of the leather. From a well-grown hide tympans can be cut close up to the neck. When the hides are dressed whole, that is, with the bellies on, there is no possibility of getting the stretch out, which is very necessary.

How Photo-Lithography is done.—When the photographer wishes to produce a number of copies of a landscape or a portrait, he first of all makes a "negative," a kind of transparency, in which the parts corresponding with the dark portions of the original are transparent, while those corresponding with the lights are opaque. This negative is placed on paper so prepared that it goes dark when exposed to the light. Accordingly, those parts which are covered by the opaque parts of the negative remain of the original colour, but those which the light penetrates through become dark. In this way a paper positive is produced—a picture in which lights and shades are correctly reproduced. The object of photo-lithography is to get a picture transferred to the lithographic stone in fatty ink, so that prints may be struck off in the ordinary lithographic manner. A sheet of plain paper is coated with a

solution of which gelatine is one of the principal constituents. The paper is dried, and then soaked in bichromate of potassium when it becomes sensitive. It is placed under the negative, and when the print has been made, it is entirely covered with printing-ink. It is next soaked well in warm water, and, strange though it may appear, when gently brushed over, the ink will be removed from all those parts which were not exposed to the light. In fact, there is an image in fatty ink on the paper. To lay it face downwards on a litho stone and make a transfer is but the ordinary system of lithography. From the stone may be printed almost any number of "photo-lithographs."

Retouching Photographs for Photo-Lithography.—Before retouching photographs having a high degree of gloss, rub over a solution of beaten white of egg, having decanted the liquid and added a few drops of ammonia; keep solution well corked. Glycerine rubbed over the surface of the photo does well too.

A Preparation for Stones.—A compound, called "The Universal Preparation," has been introduced in America. It consists of pure gum arabic and a chrome salt, and a few chemicals to keep the preparation in good order. The properties claimed are: That this preparation is not an acid, but so composed that when applied it is impossible to spoil the stone even with the grossest carelessness; that it will prevent tinting, filling up, or smearing up of the work; that no double or repeated preparing is necessary, as the work after one application will remain unchanged on the stone, and that by using this preparation stoppage of the press to etch or clean the same will be prevented, and the work can be done mechanically, while running at fastest speed, by any pressman or printer.

Preparations for Zinc Plates.—There are few lithographic printers who do not know that zinc plates may be used as substitutes for stones in lithography, but the majority have no knowledge of how they are prepared for printing. Lithographic stones are sensibly porous, and are equally ready, when clean, to take up water or grease. Zinc plates, on the contrary, are practically too dense to

receive any but a superficial application of either grease or water; hence it becomes necessary to produce upon them an artificial coating having a distinct affinity for gum and water, and a quality of resisting the encroachment of the fatty ink. This quality is best secured by a solution of gall-nuts, applied with a brush, followed by gum-water, or, according to the practice of some workers, the gum may be mixed with the galls. Make a decoction of the best Aleppo galls by steeping 4 oz. in 3 quarts of water for twenty-four hours, and then boil up and strain. The nuts should be broken up small. Then take:

Decoction of Galls	$\frac{3}{4}$ pint
Solution of Gum (thickness of cream)...	$\frac{1}{4}$,,
Solution of Phosphoric Acid...	3 drams

ANOTHER ETCHING SOLUTION.—This may be made as follows:

Gall-nuts, bruised	$1\frac{1}{4}$ oz.
Water	1 pint
Nitric Acid	2 drams
Acetic Acid	4 drops

The galls are boiled in the water until it is reduced to one-third its bulk. To the strained liquor the acids are added. Both these recipes are doubtless very good. Their value lies in the gall-nut solution, however, and that may quite effectually be used alone. The gummed plate must be dried quickly by artificial heat; the ink should be applied by the roller while the gum is dry, and when fully blacked the water should be sprinkled over it, and the rolling continued, with occasional sprinkling, until the plate becomes clean. It is then ready for printing in the ordinary manner of lithography.

ZINC PLATES AS SUBSTITUTES FOR LITHOGRAPHIC STONES.—An ingenious and cheap method of producing a stony surface upon a metal plate, to be used in a lithographic press instead of the ordinary stone, has recently been patented. Slack lime is added to a water-bath, which is afterwards treated with carbonic acid. A saturated solution of bicarbonate of lime is thus produced, which can be

drawn off as a clear liquid. A carefully cleaned metal plate is moistened with this liquid by a spray apparatus, and then dried by heat. The operation is repeated until a deposit of limestone firmly adheres to the plate, when it is ready for receiving the lithographic ink.

Litho-Bronze Printing.—It is occasionally required to print in bronze, at short notice, both sides of ball programmes and similar work. In the ordinary way, one side would be allowed to dry before the other was printed, but there is no time for this as a rule. The secret is to employ drawing-paper or ivory cards, which are not very absorbent of ink. The stone having been made up to work both sides at once, a stiff ink is employed, and the cards printed and backed before the bronze is applied. This will be found quite effective, and simpler than bronzing one side and then printing and bronzing the other. The second printing, in the latter case, would be sure to force the ink through the first applied bronze and necessitate re-bronzing, while in the mode here recommended there is sufficient ink left (despite the set-off taken from it) to hold the bronze, and thus one bronzing is all that is required.

The Photo-Stone Process.—This is a patented method of reproducing pictures or designs in colour by means of a series of photo-transfers, and by which, it is claimed, a very satisfactory effect can be attained in seven or eight workings, with much less labour to the artist than with the ordinary chromo-lithographic method in twelve or fourteen. It is as follows: The subject selected is carefully looked over by the artist, and the size (preferably less than the original) and the number of workings fixed. The original with these details is forwarded to The Photo-Stone Syndicate through their agents, and in due time the transfers necessary for the number of workings, with one or two over, are forwarded, carefully packed. These transfers are then handed over to the artist, who will find that all are alike photographs from the original through a fine screen, but no help given by, or variance in value by, colour filters. He can only select from his transfers, which vary in depth of tone, those most suitable to the colours of his scale,

mark them accordingly, and give them to the printer, who must put them down dry on a slightly damped, finely-grained stone, with slight pressure at first, to ensure true register. When thoroughly in contact with the stone, the back of the transfer should be treated with warm water, the paper removed, and the stone carefully washed, when it is ready for the artist. This part of the process must be performed with great care, as the transfer requires very delicate handling, the dots being so minute. The artist treats the stone just as if it were an ordinary grained stone, using the photo-key as if it were an actual printable drawing, only he proceeds to perfect each colour in the various gradations necessary to reproduce the coloured original, by polishing, or scraping out, or toning down, or by strengthening the details of the picture with the ordinary chalk crayon. When finished, the stone should be dusted over with French chalk, gummed with slightly acidulated gum, and allowed to stand overnight before rubbing up. The rolling up of the stone is proceeded with as in an ordinary chalk lithograph, only care should be taken not to rub too hard so as to injure the work. Should the work not come up freely enough, assist by going over stone with a few drops of turps, and roll up again before the turps is evaporated. When the stone is properly rolled up, give it a slight etch. Wash out again, roll well up, resin the stone, burn in with a blow-lamp or Bunsen burner, taking care not to overheat the resin, and then give a good strong etch, and the stone is ready for proving. Transfers from original for polished stones must be pulled "spare," as in ordinary chalk transfers, and treated accordingly, only, of course, with exceptional care, because of the exceeding fineness of the work.

New Method of Transferring from Metal to Stone.—A German patent has been granted for the following process of litho-transferring. Instead of pulling a transfer from the metal plate and running it on to the stone, the transfer is made direct from the plate to the stone. If the design on the plate is photographically produced it must be done without a mirror or reversing prism, as in this case the final result from the stone would be reversed. It

is specially used for the transferring of half-tone pictures, which need not be deeply etched. This method is as follows: Roll up the plate with ordinary transfer ink; put the stone in a copperplate press on a bedding of cardboard or paper to give elasticity. Then put the plate face downwards on the top, and over that another lot of packing, and run it through the machine. The after manipulations are exactly the same as for any other transfer.

Hints for Transferrers.—A draughtsman and transferrer of considerable practice has written in favour of the roller in bringing up crayon and line work on stone. Always see that the transfer ink is of good quality, kept fresh, and never allowed to harden upon the roller. If the work is transferred to stone and appears weak, wash with clean water; then, if practicable, heat the stone slightly and allow it to lie without gum about two hours longer. This is found to give much better results than any manipulation with sponges could effect. Let any transferrer use a good magnifying glass and he will observe very minute fibres charged with the ink, which leave the sponge and adhere to the ink already on the stone. These fibres are unaffected by water; the acid burns them away, but leaves the ink adhering to and making larger the dots of the crayon drawing. Hence the drawing is made heavier and its delicacy of tone injured. A substitute for sponge may be had in fine woollen cloth, or, better still, a piece of uncoloured silk. These have not the same tacky qualities as the sponge, but after being used several times have to be cast aside, owing to the glazing of the ink upon them. The roller is found to be the quickest, cleanest, and in most respects to give the best results.

A Simple Method of Transposition.—Take the impression of the subject to be transposed (white to black, or black to white): when dry enough not to rub, but still fresh, dust over with very finely-powdered gum, tapping the sheet firmly to remove any surplus powder lying loose about the sheet as if for a reverse. Take a thoroughly clean, well-polished stone, slightly damp it, put the dusted

impression face down upon it, and pull through the hand-press with a very slight pressure. Give stone a gentle heat, and roll up carefully with transfer roller. Allow stone to cool, and wash out with sponge well charged with water, when a clean sharp reverse of the subject will appear upon the stone. Etch and prepare this in the usual way, either to print or take transfers from. Take care that the stone be not over-damp, nor the pressure too great, or the gum will spread and the result be disappointing.

Preserving Drawings on Stone after Printing.—It is too often the practice in lithographic printing offices to take but little notice of the stone when the first order has been executed, but if there be only a remote chance of its being required again means ought to be taken to ensure that the stone is in fair printing condition when another edition is called for. The stone may not be wanted again for months, or even years, but the ordinary ink may become so dry in a few weeks as to become insoluble in turpentine, and to have lost its power of resisting the adhesion to it of water. Hence the necessity of preparing it in some manner that will permit removal of the ink by turpentine, so that the stone will be in the same condition as when first printed from. Drawings may be preserved by the use of the following ink, to which some recommend the addition of soap; this, however, is not only unnecessary, but may prove really mischievous:

Ordinary ink, as bought from the maker ...	2 oz.
Tallow	2 ,,
Beeswax	4 ,,

The tallow and wax are to be melted, and the printing-ink added a little at a time until dissolved. When about to be used, a small quantity must be ground with turpentine until of the consistency of ordinary printing-ink. Wash out the drawing with turpentine in the ordinary way, and roll-in with the ink until the drawing shows clearly, using a small quantity of gum-water on the stone to keep it clean. Set the stone aside for a few hours until the turpentine has evaporated, and then gum-in.

Another Method to Protect Drawings on Stone.—The protection of drawings on stone is a question in all lithographic houses. The rule is to roll the stone up with colour and gum it; but excellent as this plan is, the gum is liable to scale away, leaving the stone exposed to damage. A Paris paper gives a new plan to the same end, which has been applied with great success. The preservative compound is thus composed: 150 parts spermaceti, 140 parts Burgundy pitch, 90 parts olive oil, 50 parts white wax, 30 parts Venetian turpentine. These to be melted together. The composition is applied to the stone with a roller. It covers the stone and protects it in all temperatures, even if exposed to the weather out of doors.

Another Method.—Roll in the stone with ordinary printing-ink. Dust with powdered resin and allow time for the ink and resin to incorporate and become hard. Take a spoilt impression of the job, and gum over the back of it with gum-water, lay its gummed side to the stone, and pull through the press. Gumming the paper instead of the stone will more effectually exclude the air, and thus prevent "oxidation" of the ink, for which "drying" is only another name. If the stone is to be laid by in a very dry place, the addition of a little glycerine to the gum will prevent its cracking. It is better than sugar, molasses, etc.

How to use Lithophine.—Lithophine is a material, of American invention, said to make the drawing more permanent upon the stone, and may be applied to work partially worn out, or to transfers newly laid down when they show a little tendency to weakness. It may also be used upon any work as a precaution in preventing deterioration. The following method of using it is suggested in preference to that given in the instructions sold with it, though it does not differ from it in principle: Gum in the work with gum that is not very thin, and dab it over with a cloth to prevent it overlaying the ink. Allow the gum to dry, and then wash out with lithophine, which must be well shaken up, and allow it to evaporate on the stone, which it does rapidly. The gum must be then washed off

with plenty of water, and the job rolled-up. Treated thus, it has the maximum effect, consistent with freedom from scum or tint, upon the stone, to which it is somewhat liable if carelessly used.

Covering Machine Damping Rollers.—The best material for this purpose is moleskin. It is a thick twill cotton material, about one-sixteenth of an inch in thickness, commonly in use for clothing by mechanics, and valued for its washing qualities. It may be had at most drapers, or of the warehousemen in towns who supply tailors. For the present purpose, it should be chosen of white or light stone-colour. Lay a piece of it out upon a smooth board, and with a knife and straight-edge make a clean even cut across the piece, as one may be sure that the draper has not cut it straight enough with his scissors. Take a narrow piece thus cut off and accurately measure the roller round its felt or flannel undercovering. Measure it at each end, to be sure of making the new cover fit with accuracy. Then cut a strip the proper size and length for the roller. Now, with a stout waxed thread, sew it on the roller, putting the needle in on the under side of the edge and pulling it out on the upper, taking hold of about one-eighth of an inch of the stuff at each stitch, carefully pulling the thread in such a manner as to make the edges meet neatly, but not to overlap. After sewing an inch or two, it will be seen if the cover is the proper size. If too small, cut another; if too large, take it off and cut a strip off it. When sewn on, secure the ends like ordinary roller-ends. Before being put in the machine, they should be thoroughly wetted with boiling water, as, when the moleskin is quite new, it has a tendency to repel cold water, while it takes hot water readily. One of these rollers will damp nearly as effectually as two covered with canvas, and will last many times as long.

Cleaning Lithographic Rollers.—If the ink has dried on hard, soak the roller in turps for a day or two, then scrape off the ink with a knife, wash with turps and wipe with a clean rag. A little salt used in conjunction with the turps will assist the operation.

A Pneumatic Roller.—The pneumatic roller consists of a stout rubber cylinder or tube, to which metal handles are ingeniously fitted, one of the handles forming the air valve. The outer covering or skin consists, as before, of calf skin. This skin can be removed in less than half a minute by a simple deflation of the tube, and replaced again with almost equal facility. It will be easy, therefore, to convert a black roller into a colour roller, or vice versa. It is the purpose of the inventor to adapt his idea to machine rollers also—damping rollers, and varnishing machine rollers, and there is little doubt that it will serve these purposes admirably.

An Improvement in Lithographic Damping Rollers.—Instead of the numerous rolls of felt, flannel, or other material now used to make up the desired thickness, interpose between the iron core and the outer covering a thick india-rubber tube, which will render the roller elastic, protect the metal from corrosion, and do away with many thicknesses of flannel or felt, at the same time keeping the roller in good shape, no matter what sized stone may be in use.

The Glazing of Litho Rollers.—This is accomplished by rolling them up in a colour, such as orange-lead, which dries quickly either with or without driers, and varnish.

Theory and Practice of Developing Photo Prints on Aluminium Plates.—Clean the plate, then coat in dark room while still wet, with a solution of glue, white of egg, water, and chrome ammonia, expose from one-half to three minutes, cover with a dabber containing greasy ink (*e.g.*, a mixture of litho ink, asphalt, tallow, turpentine, and oil of lavender). Then lay plate in water and rub with a ball of cotton until developed. Then etch with gum and a little phosphoric acid and roll up with the same ink, finally etch a little stronger. The theory is that the light hardens the exposed parts of gelatine and causes the ink to hold to it. The covered up parts, while protected from light by the negative, swell up, that is, become hygroscopic in water

and refuse to hold the ink, consequently dissolve and float away, leaving those places of plate open to the action of acid.

THE TINTING OF STONE BY INFERIOR COATED PAPER.—If it has been found that the tinting of a stone in the press has been caused by inferior paper, the stone should be cleaned carefully, rolled up strong, and etched high; by this operation contact of the paper with the general surface of stone will be diminished, otherwise it is better not to use papers which have been coated with the aid of astringent substances which are bound to extract the preparation from the surface. The tricks which some printers profess to possess, namely, mixing a certain something to the dampening water, are poor makeshifts, and will sooner or later ruin the work on the stone.

HIGH ETCHING ON ALUMINIUM.—After fusing the design on the aluminium with asphaltum, etch with the following: Take concentrated chloride of copper (green crystals); dissolve in water until sated without a deposit; take one part of this to six parts of water and add one-tenth part of acetic acid. The colour will be a light blue. Wet the surface of plate and pour over the liquid, using a broad bristle brush. Repeat several times.

GUM GAMBOGE ON STONE AND ALUMINIUM.—When using gamboge on stone it should be mixed with a little gum arabic, but when stopping out patterns on crayon work, especially on aluminium, it is liable to crack or split off. To prevent this, a little glycerine should be added.

A METHOD OF GRAINING PLATES.—This consists in producing the grain by covering the surface of the stone or zinc plate with sand and rolling this sanded surface with spherical balls, which serve to press the sand against the plate without scratching or wearing the plate unevenly. A shaking bed is employed, upon which the zinc plate is secured. The bed is provided with raised sides and supporting wheels, which run upon two tracks; the shaft is held in stands and provided with a slotted crank disk, from which connection is made to the bed. Upon the plate a

quantity of sand is placed, and a number of spherical balls, which are preferably made of glass. The rotary movement of the shaft will cause a reciprocating movement of the bed and the attached plate, which at the proper rate of speed and throw will impart a rolling movement to the spherical balls, thus serving to press the grains of sand against the plate, and producing the finely grained surface required for surface-printing; in order to secure the best result a supply of water is also added to the sand and spherical balls, which are preferably about the size of large marbles. In this case the desired effect upon the plate will be produced with great rapidity and of fine quality. Instead of the zinc plate, which is attached to the bed, a lithographic stone plate may be grained by the same process, the stone being let into a recess in the bed or otherwise arranged so that the sand and balls can have a surrounding level surface over which to move, in order to be able to grain the surface of the stone to its extreme edges.

Lithographic Printing on Hard, Rough Paper.—Hard, rough paper is, of course, more difficult to print dry than a soft, smooth one. The only way to do it is to etch up the transfer as high as possible. This is done by repeated etchings with nitric acid, having fused the dusted resin with the ink on the transfer by means of a flame. This process is called "burn-etching." The packing on the cylinder must consist of a hard, smooth sheet and the ink should be rather thin. Most of the first-class commercial work done in America is printed from high-etched stones. Aluminium printing surfaces do not permit of high etching and are not so well adapted to this class of work.

A Process of Gold and Silver Printing in Lithography.—Suppose that a show-card, or anything similar, is to be printed in colours, say, in silver, gold, yellow, red, blue, black, and flesh colour; these seven colours can be done in five printings. The artist finishes the yellow, red, blue, flesh, and black plates in the usual way; but before etching he adds the gold plate to both the blue and the original plates. No matter if this comes in contact with the other work; remember that the blue and gold are to be

done at one printing, and also red and gold. Add to the yellow and flesh-colour drawings the same work that would be necessary for the silver printing; for the same manipulations have to be made as with the red, blue, and gold plates. Leave the black as drawn. In printing do not use any drier in the colour. Print the yellow first, in the usual way, and let the sheet get perfectly dry: the time will vary according to the ink and paper used. Now print the flesh colour with, in winter, mostly No. 2 varnish; in summer, mixed with No. 3 and 0. Let the impressions lie, according to the paper, from one to five hours, then run them, for the silver bronzing, through the bronzing machine, or bronze them by hand. Where the flesh colour is done on the clean paper the printing is dry and will refuse to take the bronze, and where the flesh colour is printed over the yellow the bronze will stick solid, even if done on the second day. It is only required that the bronzing shall be done at the right time; but this is not a matter of so much anxiety as one might suppose. The impressions have to be dusted off in the usual manner, and then the third printing should be the blue. Let the ink dry again, and then print the red. The same care and manipulation should be had as stated with regard to the silver. After the gold is dusted, print the black. This is the full process, given so plainly that every artist and printer can understand it. The advantage is that two printings are saved. When it is remembered that bronze is desired in nearly all lithographic work, and when one can do it, as now, without incurring any extra expense, it should be easy to understand that this is an advantage not to be undervalued, because bronze printing is generally charged the price of two printings.

To Wash Out a Job with Safety.—A drawing newly placed upon the stone, whether by transferring or drawing, may be easily injured by being washed out too cleanly with spirits of turpentine. The old composition of turpentine, oil, and gum-water, shaken up into a froth, was correct in principle and easy enough in practice, though rarely to be found in use at the present day. Its only drawbacks are that it requires a separate bottle to keep it in, and the foresight to prepare it. As all lithographic printers have the

materials at hand, the same results may be obtained by the addition of any kind of oil, in the ordinary way of washing out. Proceed thus: Roll in the work, if the ink is dry, and then apply gum-water. Throw a few drops of oil upon the wet stone, and then a few drops of turps; then rub it with a rag or flannel until the ink is dissolved. If necessary to give it much rubbing, add a little thin gum-water, from time to time, to prevent the stone from getting dry. The office of the materials may be thus stated: the turps dissolves the ink, the oil preserves the necessary fatty character of the drawing, and the gum-water keeps the rest of the stone from contracting scum or tint. This is a safe method, and in no way injurious.

Recipe for Lithographic Etching Ground.—Take $1\frac{1}{2}$ ounce asphaltum, $1\frac{1}{4}$ ounce bleached wax, $1\frac{1}{2}$ ounce mastic, $\frac{1}{2}$ ounce pure pitch, $\frac{1}{4}$ ounce resin. These ingredients are to be boiled together. This is best done by an apothecary. When hard, the same is broken into small pieces and dissolved in pure turpentine to a thick, syrupy liquid. In another bottle mix 1 pint damar varnish, $\frac{1}{2}$ pint turpentine, and $\frac{1}{2}$ pint sulphuric ether. A third bottle is used to mix enough of both liquids to supply the demand. This ground will flow smoothly and evenly, will last long on stone and stand a great amount of etching.

How to use Soap as a "Doctor."—Sometimes by accident a drawing gets over-etched, or some acid is dropped upon it, so that the work will not receive the ink from the roller. The use of lithophine in this instance may not be instrumental in restoring it. Rubbing-up with gum and re-transfer ink, or ink mixed with palm oil or gold size, will perhaps only temporarily improve it. When the roller is applied, the ink comes away from the weak place because the ink fit for rolling-in the job is stronger than that applied with the rubbing-up rag. Also, the rubbed-in ink has not penetrated to the stone sufficiently to have a firm hold. Strong litho-writing ink is at times used with the rag in a similar way, and in extreme cases a strong solution of soap is carefully applied with gum to keep it off the clean part of the stone. The mode of applying soap is wrong

in principle; for being soluble and used with gum-water its tendency to penetrate the stone is almost greater where the work is not than where it is, because it is like applying soapy water to a place partially greasy. It is possible, however, to use the soap remedy in a more effectual way. Having temporarily restored the work by rubbing it up in gum with ink and oil, gum-in carefully, and dab it over with the damping cloth so that the gum is left on the clean stone, but not on the lines of the drawing. Allow the gum to dry hard, so that it does not feel clammy. Wash out the ink clean with turpentine, with the gum still dry upon the stone. Then take a piece of dry soap and rub it well into the weak place. It will not dissolve the gum, which therefore protects the stone from its action, excepting where it has been inked. Remove the superfluous soap by rubbing it with a rag charged with oil. Dissolve the gum and roll-up, when most likely the work will be restored; if not quite so, repeat the operation.

What are Lithogravure, Lithotype, Typolithography, Cereotype, Photo-Engraving?—These terms relate to imitations of lithographed commercial work, printed upon the type press from raised zinc or copper plates and any kind of intaglio engraving executed upon stone, copper, or steel plate, can be transferred by a good lithographic transferrer, upon a finely polished zinc or copper plate, and then etched high by a good process engraver, so that it can be printed by an expert type printer upon a small platen press, and the result is called "lithogravure." As to "lithotype," "typolithography," etc., any person conversant with the engraving methods practised to-day in the graphic arts can tell how the respective proof or impressions have been made. Another class of engraving which comes close to this work is "cereotype" and "photo-engraving." The former is done on a wax coating, spread upon a polished steel plate. Hand or machine engraving upon the wax enables the electrotyper to form off the work, and obtain a superior typographic printing-plate, resembling litho-engraving closely, if well printed. The latter is the cheapest of all the typo-engraving processes, and in the reproduction by photo-chemical manipulation of an en-

larged drawing, where ruled shades, clouding, stippled tints, etc., are executed by means of shading films, ruled papers, shading pads and stumps, or areograph, there is a great field still awaiting development on these lines.

THE INVENTION OF LITHOGRAPHY.—The claim that Senefelder himself made every invention connected with lithography to the present time, with the exception of the steam press and that portion belonging to or connected with photography, is beyond dispute. He invented the chemical way of lithographic printing in 1796; relief etching on stone and etching-engraving in the same year, and built the first lithographic hand-press in 1797; he invented the engraving process in 1798, and the lithographic transfer the same year; autography in 1799; crayon drawing in 1799, and the anastatic printing process in 1800; metallography in 1805; lithographic tint printing in 1807, and colour printing in 1808. He also invented a chemical process to make artificial lithographic stones in 1818, and a method of making paper stereotypes in 1825, and he furthermore invented chromography and oleography, or printing in imitation of oil painting, in the year 1826.

ZINC ETCH FOR SURFACE PRINTING.—A writer states that he has used the following etch in printing from zinc with marked success for some years: Five parts strained gum arabic, $2\frac{3}{4}$ parts gall-nut decoction, and $\frac{1}{4}$ part chromic acid.

VEINS IN LITHOGRAPHIC STONES.—Veins of any kind are very detrimental to lithography. In the first place, so-called rust or iron veins will cause a stone to break, if marked, or running in a straight line. The gray or slate veins are usually of such a dense composition that the work will not hold fast on them. The quartz or glass veins will likewise not hold the work; finally, the chalk veins are porous and will take the ink during printing.

LITHOGRAPHING ON TEXTILE FABRICS.—Lithographing on textile fabrics has become popular in America of late. Many establishments are producing large lithographs of artistic subjects printed directly on canvas or other fabric

for interior decorations. Printing of dainty subjects for fans, greetings, cushions, etc., on silk and satin, is becoming quite an industry, and many persons are kept busy designing and reproducing this artistic work. On most of the late work in this line the colour scheme is subdued and gentle; soft grays play with pinks and greens, and warm yellows shed their golden radiance over backgrounds. Could lithographers at home do any better than follow suit in this departure? There seems a wide field in this direction well worth consideration and practical development.

Solution for Hot Weather Damping.—To keep the stone moist during the hot season take glycerine 4 ounces, tartrate potassa 1 ounce, gum (dissolved) 1 ounce; add to the damping water. It is not new, but it has not been supplanted by anything better as yet.

The Colour Prover.—Leaving the artistic processes out of consideration, the colour prover comes nearer to being an artist than any other man in the lithographic profession. He must exercise good judgement and taste, and have a very fine appreciation for colour values. Besides all this, of course, he must be a thoroughly good lithographic printer, and understand the chemistry of colours.

Varnish for Preserving Charcoal Drawings.—Gum mastic is soluble only in turpentine, chloroform, ether, acetone, oil of cloves. The best substance for protecting coal or pastel drawings is bleached shellac dissolved in alcohol. The liquid is placed in a bottle having an atomizer attached, and is then sprayed over the drawing.

Calc Sinter Plates.—Calc sinter or lime sinter-plates are manufactured as substitutes for the lithographic stone. These consist of zinc plates with a thin layer of carbonate of lime. The process of manufacture is said to be as follows: To a water-bath slaked lime is added until some of it remains undissolved, and then carbonic acid is added slowly and continuously, until the mixture reacts sour. Thus a satiated solution of carbonate of lime is obtained,

which is poured as a clear fluid from the mass. With this fluid, filtered, a thin clear metal plate (zinc has proved to be the best) is covered in the shape of a fine spray. When this has been done, the plate is slightly warmed, but not to such an extent as to bring about coagulation upon the surface. The process is repeated until a layer of great durability is secured. This coat is said to have exactly the properties of the natural lithographic stone, possessing a very fine and uniform grain.

Transfers on Bristol Board.—Nearly every litho printer has scores of original stones locked up, from which impressions have not been made for years; yet, for some reason, perhaps, they must be kept in stock. Would it not be possible to reduce such stock by taking good black impressions of many of the formes on Bristol board, so that if the work should be afterwards required, a photo-litho transfer could be made at a trifling cost and transferred to stone again in the usual way? The Bristol board impression could be kept in stout brown paper envelopes, and labelled with a rough impression of the job for ready reference. It is a simple notion, but a practical one.

Retouching the Transfer Impression before Transferring.—Where the space is too small to patch a bit of transfer paper over the spot it can be touched by a brush dipped in chinese white with a gum solution; this will prevent the transfer ink from touching the stone. In the same way a line of lettering, etc., can be printed upon an impression made on transfer paper, say from a flat ruling, by inking up with a solution of gum mixed with a little Chinese white. After transferring upon stone or plate the lettering will appear cut out white upon the dark ruling.

A Wrinkle about Transfers.—A photo-litho transfer is not necessarily finished with after the transference of the print it carries to stone. It can be re-inked, developed, and transferred again and again. It is useful to know this, for occasionally a transfer may fail, from a variety of causes, when it may be re-prepared in the following manner: Thin out some strong stone-to-stone transfer ink

with a little pure turpentine and distribute it thinly and evenly over the slab with a compo. roller. Roll up the transfer perfectly solid, but with just sufficient ink to give it a gray appearance; then, when the ink dries, which it will do very quickly, owing to the evaporation of the turpentine, plunge it into a dish of lukewarm water. When thoroughly soaked, lay it on a sheet of glass or other perfectly level surface, and develop by gently dabbing it with a small pad of cotton lint.

Linseed Oil.—For inking up fine engravings on stone, use boiled linseed oil. The raw oil contains in suspense so many foreign substances of a vegetable and gummy nature, that it may have an injurious effect upon the fine lines of an engraving.

Lithographic Chalk.—Common or Castile soap, $1\frac{1}{2}$ oz.; tallow, 2 oz.; virgin wax, $2\frac{1}{2}$ oz.; shellac, 1 oz.; lamp-black, 1 oz.

Substitute for Pumice Stone.—Owing to the scarcity of clear and fine grained pumice stone, as it is used in lithographic establishments for polishing purposes, the demand for a suitable substitute for polishing lithograph stone has at last been met in a German manufacture called Litolit. These blocks are said to be an improvement on the old pieces of lava rock, always uneven in grit and texture, which at the same time are becoming so scarce and dear. These polishing blocks are not to be understood to mean the old "Schumacher sand bricks" used for taking the sand holes out of the rough ground stones. The suction in the latter blocks is avoided in the new product by two holes in the bottom; the shape fits the hand. Three sizes are made. They can only be used for high polishing.

ENGRAVING AND PROCESS WORK

DEFINITION OF PHOTO PROCESSES FOR PRINTING. —There are four leading lines of photo-mechanical printing methods—photo-engraving, photo-lithography, photo-gelatine, and photogravure. Photo-engraving is understood to mean "cuts to print with type." Photo-lithography is the process by which a stone is prepared for ordinary lithographic printing by photography instead of by hand. In photo-engraving and photo-lithography the prints must be made in dots or lines; but by an ingenious device the half-tone of the photograph is closely imitated. This is effected by breaking up the half-tone into a series of very fine dots or lines The methods mostly in use are those which give true photographic half-tone. Then there are the photo-gelatine and the photogravure methods. The photo-gelatine process is known under a multitude of names, such as albertype, heliotype, artotype, lichtdruck, indotint, collotype; but they all mean the same thing—printing from the surface of a layer of gelatine, variously supported, and on which a printing image has been produced by light. In photogravure a copperplate takes the place of the litho stone.

ZINC ETCHING BY THE ASPHALT PROCESS.—This recommends itself by the sharpness of the etched line, although its sensitiveness, in comparison with chromized albumen or gelatine, is a hindrance to its use. It is necessary to print by sun or electric light. The negative must be reversed by the mirror or a stripping film is used. The asphalt employed in photography is tne Syrian. It can be sensitized in two ways. The first is by previous exposure to the light. In 100 grams of benzine dissolve 5

grams of asphalt and add 50 drops of oil of lavender. This, half filling a loosely stoppered flask, is placed in a strong light for from five to eight hours. The second is by chemical purification. Dissolve coarsely powdered asphaltum in chloroform. After complete solution (in twenty-four hours) add three times the quantity of ether; the whole is allowed to stand, with frequent shaking, for three days. The ether is then poured off, the separate resin washed once with ether, and the residue collected on a filter. Dry in the dark. The asphalt chloroform solution may be stirred with strong alcohol, which removes the last portions of non-sensitive asphalt. To 5 grams of the purified asphalt add 100 grams benzole and a little Peruvian balsam. To each 100 c. cm. add 50 drops (3 c. cm.) of oil of lavender. This gives in development clearer lines. Filter the solution each time before use. The asphalt solution works better after a week or two than when fresh. A little aniline violet dissolved in chloroform and added to the solution makes the lines show more clearly in development. The polished zinc plate is thinly coated with the solution and dried by gentle warming. The exposure in sunlight is from ten to thirty minutes. It is developed in turpentine, applied with cotton wool or a badger brush, washed under a gentle stream of water and etched; or the plate may be dried with the bellows and etched. The first etching lasts, with nitric acid, from one to three minutes. It is then rinsed off, varnished, dried, the lines rolled in with fatty ink, and etched in the usual way.

To Harden Zinc Plates.—To harden these plates, thus rendering them more durable, it has been proposed to nickel them. Zinc, however, takes nickel badly. It is therefore recommended to apply a thin layer of quicksilver, which may be effected by putting the plates into an acidified solution of bichloride of mercury or nitrate of mercury. The solution must be left to operate only a short time, as otherwise the metal becomes brittle. Pure zinc, not amalgamated, is soon coloured yellow and brown in nickel solution; the deposit may be removed with paper. By employing a weak galvanic current, chemical action preponderates, and a bad deposit is thus obtained. If the current

is very powerful, zinc is covered more quickly with nickel than a chemical action of the zinc upon the solution can take place, and a good deposit is consequently obtained. In this way zinc may be nickelled directly. Amalgamated zinc displays a weak action upon nickel solution only after some time, and even a slight amalgamation of the zinc is sufficient to nickel perfectly with a weak current.

An Enamel for Zinc.—The following is recommended:

Glue	$5\frac{1}{2}$	ounces
Albumen	2	,,
Water	10	,,
Bichromate of ammonia ...	150	grains
Aqua ammonia	50	drops

If the enamel cracks, add 15 grains of rock candy. After development the plate is bathed for one minute in chromic acid solution, 1 grain to 10 ounces of water. This bath should be made fresh every day.

Process for Transforming Zincos into Engraved Plates.—This process permits of the transformation of ordinary zincos into engraved plates; that is, a zincographic plate, the bitumen of which is often destroyed in working, may, by this process, be replaced by an indestructible engraved plate, capable of furnishing an unlimited number of copies. The operation is briefly as follows: Take an ordinary zincographic plate, the bitumen of which is already inked, pass it quickly through a solution of nitric acid, clean it with a soft brush, wash thoroughly, and plunge it into a copper bath, where it should remain five minutes. The zinc becomes coated with copper, which adheres to every part left unprotected by the bitumen. The heavier parts of the image contract, and become even finer by the action of the copper bath. When the surface of the zinc has assumed a fine red, the plate is withdrawn and placed in a basin containing a little pure benzine. The bitumen is now removed with a brush from the surface of the plate, the drawing showing a bright white on a sombre, copper-red ground. When the zinc is freed from the varnish which remained on the drawing, the surface is thoroughly

washed, to remove the benzine, and afterwards rubbed with a rag or a sponge in a tub of water. The plate is then placed, without being wiped, in the nitric acid bath previously used. It will then be seen that the naked zinc of the image is alone bitten, the coppered surface having resisted the action of the acid. After fifty to sixty seconds a fine plate will have been produced, without a drawing or a positive cliché. Making-ready and inking are done in the ordinary manner. A more prolonged biting, demanding, on the surface of the zinc, a thicker coating of copper, strengthened, if need be, at the battery, will give zincos resembling copper plate. In this case, to preserve the various parts of the bitumen intact, they should be thoroughly inked before coating the naked zinc. As the copper resists the acid during the process of engraving, all defects in the zinc will be obviated. This process is thus valuable for obtaining thickly-coppered zinc plates at a cheaper rate than those made entirely of copper. Typographic plates may also be obtained by this process. For this purpose positive clichés, or very dark drawings on translucent paper, are used, the manipulations being the same as those before indicated.

Autograph Ink for Zinc Etching.—Rub up with the etching-ink spirits of turpentine to thin it and oil of lavender to give it consistency. Either one of these solvents of the ink should be added drop by drop.

The Oxidation of Zinco Blocks.—It is said that with zincotypes the greatest cleanliness is important, as oxidation occurs rapidly in this kind of engraving. Zinc oxidizes quickly when exposed to the air or to alkaline liquids; when once formed, it freely develops under the influence of the soda potash. The use of benzine or spirits of turpentine is recommended, drying with a rag, and then placing the zincotype in a drawer. When washing formes, dirty water is often used. This always contains potash, petroleum, spirits, and dirt. This is another cause of rusting. Another habit is no less injurious. When the potash does not act quickly enough, some washers are accustomed to pour spirits of turpentine on the brush or on a rag and to

rub the rebellious spots, without taking the precaution to use a little potash and clean water afterwards. Chemists have ascertained that spirit of turpentine, especially when old, absorbs oxygen from the air and ozonizes it—transforms it into an active and positive oxide which acts very energetically: so that any spirit remaining on a forme not only favours, but actually excites, the development of the oxide on the type.

Engraving on Zinc.—Some investigations have been made as to the use that can be made of amalgamated zinc. The property of an amalgam of zinc and mercury in repelling fatty ink is already known, drawings made on zinc with mercury being unaltered after an inked roller has been passed over them. If, instead of inking the plate, a very dilute solution of nitric acid (two cubic centimètres of acid in 100 grammes of water) be flowed over it, the amalgam will be dissolved, and the lines etched in; on the contrary, if hydrochloric acid is used, the amalgam is not attacked, but the zinc is dissolved and the lines are left in relief. Now, proceeding on these principles, if the surface of a zinc plate is coated with some photographic preservative medium, such as bitumen or bichromated albumen, the parts where the metal is exposed can then be acted on by mercury, either in a liquid state or in the form of a solution of salt of that metal, and will be converted into the amalgam, which can be treated so as to produce the image in relief or in etching, as required. Another method is to take a copy of a line drawing by the gelatine process, and then dusting the image while still in a humid state will produce biniodide of mercury. This, when dry, would be applied to a plate of zinc, and a copy of the image would be produced on it in amalgam. By then plunging the plate in a bath of nitric or hydrochloric acid, as before, the image will be obtained either in relief or engraving.

Polishing Zinc Plates.—Polishing zinc plates for printing purposes is generally done by a dry process, which is very dangerous to the health of the operator; the fine particles of zinc and emery used for polishing will rise in

the air and get into the lungs, and every workman ought to tie before his mouth and nose some cotton cloth, or, better still, a damp sponge. There is also a wet process of polishing, viz., after cleaning the plates by some acid, a wet bit of cloth is dipped into pumice-stone powder, and a few minutes' polishing suffices to prepare the plates, after which a short finishing polish with fine emery powder is all that is wanted.

The Cutting of Wood Letters.—Pear tree and sycamore woods are chiefly used for small wood-letter, and pine or deal for larger sizes and blocks. If pine or deal blocks are varnished and polished they will not absorb the ink and will print much cleaner. The timber of the pear tree is of a yellow colour, and very firm and solid. The blocks with which the designs for floor-cloths are printed are made from pear-wood. When dyed black it can scarcely be distinguished from ebony.

Map-Engraving Wax.—Four ounces linseed oil, half ounce each of gum benzoin and white wax; boil two-thirds.

How to Find the Proportion of a Reduced Block.—Faintly pinhole the four corners and turn the picture face down and with a ruler and pencil draw lightly a diagonal line on the back from corner to corner, then measure from the left side the width decided upon, mark this and rule, parallel to the right-hand side of the subject, from the mark until it bisects the diagonal. The measure of this line is the correct height that the photograph will reduce to when made the width marked.

The Daguerreotype.—In a recent number of the "Century Magazine" was an article deploring the lost art of the daguerreotype, and some daguerreotypes are reproduced in half-tone to illustrate the article on the subject. As the writer worked over thirty years ago, while they were still making daguerreotypes, he offered reasons why this earliest photographic process is lost. In the first place it is not a lost art. Given the apparatus, it is one of the simplest photographic processes to learn. There are many men living who practised it, and minute descriptions of

the method are readily at hand. But the daguerreotype was so insensitive to light that under the most favourable conditions, with the head clamped fast in a head-rest, the time required for a sitting was many, many seconds, sometimes minutes; then the portrait was reversed; but one portrait could be made at a time and the material used made them expensive. The examples of daguerreotyping shown are attractive because of the picturesque and artistic costumes worn in those days. Further, only the fittest of those early portraits have survived, and for the article referred to only the choicest were taken. Finally, the half-tone reproductions were an improvement on the daguerreotypes themselves. So that, wonderful as the daguerreotype is, it has been superseded by methods of picture-taking far superior in artistic results.

Damaged Woodcuts.—A method of restoring damaged wood-engravings has been recommended. Remove all ink from the damaged part, moisten thoroughly with a solution of potash, and dry the wood again by blowing upon it for several minutes the smoke from a cigar. It is said that an engraving thus treated resumes its former state and may be at once used to print from.

To make Counter-Dies for Stamping.—Cast the counter-die upon the face of the die in type metal, and solder it to the brass backing-piece while in the press in order to get a good register.

Photo-Engraving with Bromide Prints.—Bromide of silver possesses peculiar sensitiveness for the red, green, and yellow colours which are not acted upon by other photographic agents. Many uses of this element have been developed, not only in contact-printing and making rapid proofs from the wet negative, but also in the enlargement of photographs for the photo-engraver. Hitherto the artist has made his outline sketch on red silver prints, from which the photographic half-tones were removed by bleaching, preparatory to its production as a black and white negative for photo-relief work. A permanent bromide paper is now used instead, which promises the advantage of more rapid work. To diminish the defects of the artist's

line drawing, it is usually enlarged to three or four times the size of the original. With the bromide paper the magnified positive is made in one operation, thus doing away with the glass positive, repeated focusing, developing, fixing and printing, which consume so much time. This paper is also adapted for pen-and-ink work, and it is said that it is capable of receiving the finest lines and stipple or the deepest blacks as required. It has this advantage, that while it has to undergo the operations of developing, fixing and washing, the gelatine surface is not removed, this giving it when dry a strong sizing, which has been required for the production of sharp, distinct lines, which eliminate the defects found in the soft, spongy paper hitherto used for this purpose. The bleaching process for black and white negatives is the same as that formerly employed. With the positive dark tone of a bromide print there might be difficulty in distinctly seeing the lines or stipple of Indian ink; but this is readily dissipated in the exposure and development, when, with care, an ashy-gray tone can be secured. The customary red tone can also be produced by the artist. For this purpose the uranium intensifier is used, the print being soaked in a 1 per cent. solution of nitrate of uranium, followed by re-immersion in the same solution, to which a few drops of a 2 per cent. solution of red prussiate of potash have been added, and which will give the reddish-brown tone required, the intensity of the colour depending solely upon the quantity of potash employed. Care must be taken that the red-toned prints are not turned yellow, which is likely to happen in the after-bleaching with bichloride of mercury. This colour is not favourable to subsequent photographic development, and to avoid this, cyanide of potassium is used. Prior to its use the print should be immersed for a few minutes in a weak solution of iodine and alcohol.

Recipe for Engraving on Glass.—Cover the surface of a sheet of glass with a concentrated solution of nitrate of potash, by placing the glass in a shallow pan, and pouring the solution upon it. Then along the edges of the sheet place a platinum wire, keeping it in the solution, and place

it in communication with one of the poles of a secondary battery. Then let another fine platinum wire be joined to the other pole, and incased in an isolating substance save at its point. With this wire trace on the glass the design required; a luminous streak will appear everywhere the wire touches, and however quickly it may be moved the design will be cleanly engraved on the glass. If the drawing or writing be done slowly, the lines will be engraved more deeply. Their width depends on the diameter of the wire at its end; if it be reduced to a fine point, the work may be performed with great exactitude. The metallic thread conducting the electric current thus becomes transformed into a special graver for glass, and in spite of the hardness of the substance, the operation requires no effort, for the corroding force is furnished by the action of the current upon the saline solution. Either pole may be used for engraving, but it requires a weaker current to engrave with the negative pole. If instead of a plane surface it is desired to engrave on a curved one, the same result may be obtained by thickening the solution with a gummy substance, to make it adhere to the glass, or by turning the object in a basin containing the solution, so that a freshly-wetted surface may be continually presented to the operator. These results have been obtained by means of secondary batteries, but for continuous work any other source of electricity may be used, provided it has volume and intensity enough. Thus, several Bunsen's cells, or a gramme machine, or even an electro-magnetic machine, with alternate positive and negative currents, will do.

Engraving for Printers.—When laying out a design, a box of water colours will be found useful. By colouring the proof an idea of the effect of the job when completed is obtained, and improvements will often suggest themselves which would be difficult or impossible to make after the plates are engraved. In this connection it is well to remember that three different colours can be obtained from two impressions, by laying out the blocks so that in some parts of the design one colour is worked over another. If the job is at all elaborate, an electro should be made, since if the forme has to be unlocked after the colour blocks have

been engraved, it may be impossible to get it to register exactly as in the first place. Take a few proofs on hard paper, and, before the ink becomes dry, place one of the prints face down on the tint block, secure it in place with a drop or two of paste, and run the whole through the press. A hand press is the most convenient, but the block can be locked up in a chase and the transfer taken on a job press. It will be easy to follow the outlines thus transferred to the block with a graver, and when this is done, the white spaces can be cleared out, using a narrow chisel and mallet for wider spaces, and a small gouge for delicate work. Tools for the purpose are sold by most printers' supply houses. For use on metal plates the points of the tools should be ground to an angle of about forty-five degrees. When used on wood, the angle should be more acute. Maple or boxwood is best for small blocks, and metal tint plates for large work. Various substitutes for these have been tried, the patent leather cemented to a wood base being about as good as any.

Engravers' Plate Marks.—Artists' proofs have no engraved title, but are sometimes signed in pencil by both artist and engraver. Remarque proofs usually have a device in the margin, such as a head, which constitutes remarque; formerly a part of the engraving was left unfinished, as a button or salt cellar, etc. Proofs before letters are still without title, but with artist's and engraver's names printed close to the bottom of the work. Lettered proofs have the title of the work shortly and lightly engraved in a manner capable of erasure before the title is finally placed on the plate in the print state.

A Hint for Block-Printers.—A simple and cheap method of making negative printing blocks from any lithographic engraving or drawing, or from steel and copperplate engravings, woodcuts, etc., is the following: Make any impression on ordinary lithographic transfer paper with the regular printing ink, to which a good deal of tallow has been added, and transfer the impression in the usual way to an evenly-polished zinc plate, fanning it dry. Then pour evenly over the plate a shellac solution.

When the plate is quite dry, it will be found that wherever the printing ink is on the zinc plate the shellac will not adhere to the fatty ink, and can be easily removed. On top of the shellac the zinc plate can be readily etched and an electrotype made from it. This enables the type printer to print negative work, which means a white drawing on coloured ground from any lithographic, steel, or copper-plate, type or other letterpress work. There are certain classes of work for which this method will prove very useful.

Hints on Drawing for Process Blocks.—All pen-and-ink sketches for this purpose should be pure "black and white." Freshly-made Indian ink should be used on thin white and smooth card, the Bristol boards obtainable from artists' colourmen being well adapted for this purpose. The lines should be firm and distinct, the depth of light and shade being obtained by thick and thin lines, the distance between the lines also helping this effect. The drawing should be made larger than the size intended for the block; from one and a half to double the size is a good rule. A smaller amount of work in the sketch is often more effective than an excess of pen-and-ink work. Attention to these details, with practice, will soon enable any one with a knowledge of drawing to overcome any difficulties which might otherwise be encountered.

Method of Galvano-Engraving.—The art of engraving metallic plates for printing and ornamental purposes, and styled galvano-engraving, appears to possess peculiar advantages as a method of photo-engraving metallic plates. Thus, to make an engraving, suitable metallic plates are prepared, which have the smoothness and polish of glass, and having obtained a photographic negative on a glass plate of the subject to be engraved, the operator next covers a polished plate with a bichromated gelatine film, places the photographic negative upon it, and exposes it to the light. The action of the latter renders the gelatine insoluble, so that when the negative is removed, and the gelatine plate washed, all the gelatine on the surface of the plate is removed except the duplicate of the lines of the

photograph, these remaining in relief. The proof is put for some hours in a damp place, where the lines are brought up in relief, and after the proof has been coated with plumbago, it is applied to a metal alloy placed in a special vessel; the alloy is then subjected to an ordinary pressure, and, on cooling, produces a hollow metallic plate ready to be printed. The fusible alloy employed consists of bismuth, tin, lead, and mercury, in proportions according to the hardness desired. The vessel for containing the metal has a bottom formed of a smooth, strong metallic plate; into this vessel the metal is poured, the gelatine proof immediately applied on the metal, and, the whole being covered by a second smooth metallic plate which closes the vessel, momentary pressure is applied.

The Wax Process of Engraving.—As the utility of the wax process will be more readily understood from a description of the method of producing the plates, an outline of the general features of the process will be found interesting. On a thin metal plate, with a polished and even surface, is spread an even layer of wax composition. A tracing or photograph of the object to be engraved is then made on the wax. The lines and shading are next cut through the wax to the surface of the plate with tools of various sizes, in exact imitation of the copy. If the object be a map or a diagram, with lettering, the words, letters or figures are set up in type, and pressed, word by word, into the wax to the surface of the plate. The work is then compared with the copy, and, if incorrect, is made right by melting the wax over the words or lines, thoroughly obliterating them, and re-cutting the lines, or pressing the words into their proper places. The open places between the lines and words are then built up by putting on more wax, to give relief to the printing plate, which is produced from the engraving by the ordinary electrotyping process.

Engravings may be transferred to white paper by first placing the engraving for a few seconds over the vapour of iodine, then dip a slip of white paper in a weak solution of oil of vitrol: when dry, lay the slip on the engraving and place both for a few minutes under a press: the en-

graving will be reproduced in all its delicacy and finish. Lithographs and printed matter cannot be transferred with equal success.

New Engraving Machine. — With the pantograph many methods of drawing and reproducing linework became possible, and an adaptation is in the form of an engraving machine, capable of copying on metals, ivory, and glass, whether flat, bevelled, or cylindrical surfaces. In this machine the style is guided by the right hand, while the left regulates the depth of the cut by means of a milled nut, which enables the operator to gauge the depth or lightness of the cut, or keep it constant at will. The cutter runs at a high speed, and the section of the cut may be of any form, moulded, semicircular, bevelled, rectangular, or even dovetailed. For engraving or finishing brasswork a simple, flat, double-edged drill gives a clean, brilliant cut free from burr, which may be left bright or coloured by solutions as wanted. When it is desired to fill the cut with wax, a long pointed drill is used, which gives a cut with steep sides, and leaves the bottom of the cut sufficiently rough to hold the wax. Lines are worked by a simple point tool in the cutter spindle, the style being moved along fixed straight guides, and all lettering may be done at the same setting of the machine. The machine was originally invented for engraving figures and letters on lenses and other scientific instruments, but its undoubted capacity has been adapted to a great variety of work, including name-plate engraving, embossing seals, dies, and moulds, marking and numbering instruments and tools, dividing and engraving dials, scales for gauging and measuring instruments. The machine is also equal to the performance of engine-turning and profile work, and by using suitable milling tools, in conjunction with the dividing apparatus, wheel-cutting and similar work may be executed. The engraving, of course, is not of the same size as the pattern, and the drawing may be varied from one-fourth to one-sixteenth of that of the copy.

Photo-Mezzotint Engraving.—A simple method has been published: Upon a polished steel plate spread a thin

coating of saturated solution of bichromate of ammonia, 5 drams; honey, 3 drams; albumen, 3 drams; and water, $1\frac{1}{2}$ pint. Dry thoroughly by gentle heat, and expose to light under a transparency. Next remove the plate to a place in which the air is moist. The atmosphere in an ordinary room contains moisture sufficient to act upon the surface of the picture which has been printed in this manner. The preparation given above is slightly deliquescent, and on becoming dry by the heat attracts so much moisture from the atmosphere as to become more or less tacky. But exposure to light has the tendency of hardening the film, so that the tackiness produced is in inverse ratio of the luminous action. A large camel-hair brush is now charged with a mixture of the two finest kinds of emery powder, and applied with a circular whisking motion all over the surface. As those portions of the plate on which the light did not act are the first to become tacky, the emery powder will first adhere to them, the coarsest particles attaching themselves to those parts of the picture deepest in shadow. The exposure to light ought to be such that every portion of the surface—except the extreme high lights—becomes in a condition to "take" the powder. If the image be slow in developing under this pulverulent treatment, the moisture in the atmosphere should be slightly increased. Allowing the picture to stand for five minutes longer frequently answers every purpose; moistening the air by artificial means will give the same results without delay. This film is so susceptible to moisture that the operator should take care lest his damp breath impinge on the picture, as it might result in a local predominance of the power which attaches itself in obedience to hygrometric law. After the picture has been developed, a polished plate of metal, softer than that upon which the picture is formed, must be laid down upon the other, face to face, and the two passed between a pair of rollers screwed so well together as to ensure the setting off on to, or indentation of, the emery powder image into the polished plate of metal. This plate is now precisely similar to the one produced by the mezzotint engraver. An impression having been obtained by an ordinary copperplate press, the manipulator having both proof and plate before him, applies a small burnisher with

a curved point to the various portions of the picture requiring lightening. After completing this work a second proof is obtained, and, if necessary, a second series of the alterations are made upon the plate until it is found that it yields an impression equal to the requirements of the subject.

Cereographic Engraving.—The precise composition of this wax coating is kept a trade secret. It can, however, be determined by mixing beeswax, Venice turpentine, and zinc oxide, remembering that the Venice turpentine is to harden the mixture and the zinc oxide to make it white, so that the design may be drawn upon it with a pencil. The hot mixture should be poured on flat copper plates to a thickness of a sixteenth or thirty-second of an inch, depending upon the fineness or coarseness of the engraving to be produced. When type or other characters are to be pressed into the wax coating, the whole is slightly warmed to soften the wax. Copper plates are better than steel to deposit copper on in the electrotype bath.

Doorplate Engraving.—The usual way is to draw the forms of the letters upon the plate with a steel point or a pencil, and cut out the letters with a graver. The filling matter is black or red sealing-wax. A way of etching the letters with acid has lately come into practice. With a complicated design some very pretty work is done in this way. The next is machine engraving, one kind being done by a routing machine carrying an automatic tracer traversing the pattern. Of these engraving machines there are several in the market under various patents, some as mere tracers, others as liners, while some claim universal work.

An easy Way of Engraving on Aluminium.—The process of engraving on aluminium is attended with many difficulties, but these can be greatly reduced by laying on a ground composed of gum, zinc white, and calcined lampblack, to which must be added a little glycerine to make it pliable. Spread this ground as one would a black engraving ground; put on the tracing and scratch through the ground very lightly, to lay bare the plate where the

work should appear. Where the solids occupy a considerable space, as in black-face letters, outline only and fill in when the ground is washed off later on. When all is complete, as far as engraving is concerned, apply a solution of asphaltum and allow same to dry. Then lay the plate in water and allow the black gum ground to soak off; dry quickly and fill in the solids with the lithographic ink containing shellac. The plate is then an original engraving which can be printed with the roller.

Photographing on Wood.—There are several methods in use, but they all aim at two objects. First, to get just as slight a film on the surface of the block as possible, one which will not chip off, and will offer as slight an obstruction to the graver as possible; secondly, to prevent moisture soaking into the surface of the wood. The sides of the wood block are first rubbed over with heated wax, and the surface of the block rubbed with india-rubber solution. Three solutions are kept ready for use: a solution of gelatine sixteen grains to the ounce, nitrate of silver solution eighty grains to the ounce, and a citric acid solution of forty grains to the ounce. The white of an egg is beaten to a froth and left standing over night. Now take:

White of egg	1 dram
Gelatine solution	$\frac{1}{4}$ dram
Best zinc white	$\frac{1}{8}$ ounce
Ammonium chloride	5 grains

Rub these up to a paste with a glass mortar and pestle and then, while still rubbing up, drop into the paste thirty minims of the citric acid solution, and lastly, eighty minims of the nitrate of silver solution. Paint this solution on the surface of the wood block and put in a dark, warm place to dry quickly. Print under a negative by timing with a watch, and tone or only fix as one would a plain paper print. Some simply fix and wash off the hypo, drying the moisture of the block with a soft piece of chamois skin.

Photo-Etching on Wood.—A foreigner has, by an ingenious process, extended the art of photo-etching to boxwood blocks. The block is boiled in two separate solutions,

by which the pores are filled with insoluble carbonate of copper. It is then polished on the surface, coated with a solution of asphalt on back and sides, and the face is covered with a gelatine film. The photograph is then taken on the block, and the soluble portions of the gelatine having been washed out, the remaining surface is coated with asphalt. The block is placed in strong nitric acid for an hour, and afterwards for the same period in sulphuric acid, which changes the unprotected portions into nitro-cellulose.

How Etching is Done.—Etching is considered by some as mere pen-drawing, and by others as an inferior kind of engraving. It is, however, an art distinct from either, with capabilities and limitations peculiar to itself. The process is as follows: A metal plate, preferably copper, is covered with a coat of blackened varnish or wax. On this surface the artist, with a needle not unlike a common sewing needle, set in a handle, sketches in his composition. The needle usually only removes the varnish, leaving the design in glittering lines upon a black background. The plate is then immersed in an acid bath, and when the lines have been sufficiently bitten it is removed. If variations of tone and a difference of force in the lines are required, as is usually the case, the more delicate portions of the sketch are "stopped out," that is, covered with varnish, so that they shall not be affected by any subsequent exposure in the bath. The plate is again immersed, and the process of stopping out repeated. It will be seen, even from this cursory explanation, not only that the work is autographic, but that it requires the mastery gained only by thorough artistic training, as well as natural powers of no mean order, to become a master etcher. The hand must be firm and true, the lines must all have meaning, the mind must be clear to grasp essentials, and the whole process must be purely intellectual, as no greater difference in effect can be imagined than that produced by glittering lines on a black surface, on the one hand, and that of delicately graded black lines upon a white background, on the other. A positive process is sometimes used, when the etching appears upon a plate as the black lines upon a white sur-

face, but in this process other difficulties occur, as the lines have to be etched in the order of their depth to ensure the relative amount of biting.

PRINTING AN ETCHING.—The plate is first warmed by being laid on a sheet of iron, under which small gas jets are constantly kept burning; then the ink is spread on the surface and into the lines with a dabber, the superfluous ink being wiped off with a coarse muslin rag, care being taken not to wipe the ink out of the lines while removing it from the surface. Simple as this appears when done by a practised hand, it requires considerable skill. The palm of the hand is rubbed over with a little whiting, and a final polish is given to the plate with it. The plate is now put on the travelling bed of the press, and on it is laid the paper, which should have been previously damped; over all are laid several thicknesses of flannel. On turning the handle of the press the cylinders revolve, and the travelling board passes between them carrying the plate with it. By the pressure thus obtained the paper is drawn into the lines on the plate, the process being facilitated by the elasticity of the flannel. Care must be taken not to tear the paper in removing it from the plate.

ETCHING ON STEEL.—The metal to be etched is first moderately heated, and whilst hot it is covered with a very thin coating of protective varnish, which adheres all over. This coating, called the ground, consists of 4 parts asphaltum, 2 parts Burgundy pitch, and 1 part white wax. The engraver then marks out the design, removing the ground from those parts which are intended to be etched. The tools used for this process are called etching needles, which are of various thicknesses, so that lines of corresponding breadth can be made easily. A border of wax is then made around the design, forming a trough containing the biting-in acid. This biting-in composition is diluted with nitric acid, according to some authorities; but Knight's Dictionary gives it as equal parts of pyroligneous acid and nitric acid, to which thrice the quantity of water is added. The acid is moved over the surface of the steel by the aid of a feather, so as to act more readily. By this process a

certain number of copies may be obtained from the plate, but owing to the fineness of the lines the number is very limited. Imitation etchings are now so well done that at first sight it is difficult to discover the difference.

Substitute for Sulphuric Acid in Etching.—The use of sulphuric acid for etching on zinc and copper is connected with so many disadvantages, and is so injurious to health, that a substitute has long been sought for. The following mixture has been recommended for the purpose. Forty-five grams of finely powdered gall-nuts are put in 600 grams of water, and the mixture boiled down to one-third. It is then filtered through a linen or felt filter, and three drops of concentrated nitric acid, with from four to five drops of muriatic acid, are added to the filtrate. This mixture is suitable especially for zincography. For fine work it must be somewhat diluted, and left only for a few minutes on the zinc plate. The latter is then carefully rinsed with water, and covered with a fresh and diluted solution of gum arabic. For treating copperplates, 150 grams of fuming hydrochloric acid are diluted with 1,050 grams of water, and a boiling solution of 30 grams of chlorate of potassium in 300 grams of water is added. If weaker parts are to be etched, the solution may be diluted still further with from 1,050 to 2,000 grams of water, whilst the deeper shades are produced by the addition of a stronger liquid or by exposing the plate longer to the action of the solution.

Etching on Brass.—Chromic acid is most frequently used to etch brass, while some succeed with perchloride of iron. In both cases an enamel resist is used, similar to that used on copper.

Etching on Copper.—Line or stippled drawings can be produced by the following process: The copperplate is first coated with bitumen on the turning-table, as in photo-zincography, and when the bitumen is dry, an impression from a lithographic stone on transfer paper is applied; when this paper is removed, we have a copy of the impression in fatty ink on the bitumen surface. This surface

is then dusted with fine bronze powder, which adheres to the inked portions and renders them opaque. If the surface be exposed to the light, the bitumen covered by powder will be rendered insoluble; by putting the plate in some solution which dissolves the bitumen, the copper will be laid bare in the parts not acted on by the light. These parts can then be etched in by a concentrated solution of iron perchloride, and when the depressions are sufficiently marked, the action of the mordant is arrested, and all the undissolved bitumen is removed. The result is an intaglio engraved plate. This process will not answer for the production of drawings with half-tones.

Etching on Glass.—A liquid which can be used with an ordinary pen can be made of equal parts of the double hydrogen ammonium fluoride and dried precipitated barium sulphate, ground together in a porcelain mortar. The mixture is then treated, in a platinum, lead, or gutta percha dish, with fuming hydrochloric acid, until the latter ceases to react.

Etching Metal Surfaces.—The following method of etching metallic surfaces, by which it appears possible to produce highly decorative effects, has been published. The article to be treated is electroplated with gold, silver, nickel, or other metal, and on this the proposed design is traced with some acid-resisting substance. It is then immersed in an acid bath, by the action of which those portions of the surface which are left unprotected are deprived of their electroplated coating, and the naked metal beneath is given a frosted appearance. The article is then well rinsed to remove all traces of the acid, and the acid-resisting varnish is removed by the use of alcohol, oil, or other solvent. The result is a frosted or dead-lustre surface of the original metal, upon which the design in the electroplated metal stands in relief. If, for example, the article be of copper and the plating silver, the design will be in silver upon a dead copper ground. Obviously, the operation may be reversed—that is, the design to be reproduced, instead of being protected, as in the foregoing procedure, may be left unprotected, and the remainder of the electroplated

surface covered. In this case, after going through the above operations, the design would appear to be in dead copper on a silver ground.

Etching on Iron.—Use the following mixture: Hydrochloric acid, one pint; water, one pint; concentrated solution of antimonious chloride, one drop. The last ingredient is added to prevent rusting of the etched parts. Soft and fine-grained metal is more easily acted on than any other sorts.

Etching Fluid for Steel.—The following is suggested as an excellent etching fluid for steel: Mix one ounce of sulphate of copper, one half-ounce of alum, and half a teaspoonful of salt reduced to powder, with one gill of vinegar and twenty drops of nitric acid. This fluid may be used for either eating deeply into the metal or for imparting a beautiful frosted appearance to the surface, according to the time it is allowed to act. Cover the parts to be protected from its influence with beeswax, tallow, or other similar substance.

To Engrave on Steel.—A box containing powdered cupri sulph. is required, then dissolve some of the powder in a small quantity of water; rub the surface of the steel over with a piece of wetted soap, so as to cover it with a thin coating; then dip the point of a pencil into the solution, and with it write or draw the required design on the steel. Wash after a few minutes, and the steel will be found to be beautifully and permanently engraved.

Steel-Facing Photogravure Plates.—The number of good impressions which can be taken from a copperplate are necessarily limited, and the vexatious process of multiplying the original by the galvano-plastic process has been superseded by the process of steel-facing the plates. When a copperplate is placed on the cathode, suspended in a solution of sesquichloride of iron and subjected to the action of the galvanic current, it will soon be covered with a delicate and lustrous cuticle of iron hard as steel, from which many thousands of impressions may be taken, equal

to copper or steel-faced plates. The process is carried on in a peculiarly arranged dark trough with a three-cell zinc carbon battery, and the electrodes are placed vertically. The iron solution is made suitable to the current itself. One part of chloride of ammonium is dissolved in ten parts of water, and in this solution are placed iron plates as cathode and anode. By chemical action the chlorine unites with the iron of the anode, forming sesquichloride, which remains dissolved in the bath, which within a day or two will assume a greenish colour, and owing to the formation of hydrate of oxide of iron, consequent on its contact with atmospheric air, its surface acquires a red scum, and a metallic mirror will make its appearance on the cathode. The bath is now sufficiently saturated, and in place of the iron cathode, the copperplate, previously cleaned in a solution of caustic potash, rinsed, and any adhering alkali neutralized with weak sulphuric acid and again washed and dried, is substituted. The steel cuticle can, when worn by long usage, be easily removed by laying the plates in sulphuric acid diluted so that the copper will not be affected by it. The tendency of the acid is to detach the steel from the copperplate.

Collotype.—This process is a method of printing from gelatine, glue, and similar "colloid" materials, to which a pigment is added. The word is derived from the Greek κόλλος, glue. The process is called in French *heliotype* or *phototypie,* in German *lichtdruck.*

A New Collotype Process.—The "Sinop" process is an improved collotype. Instead of the process-worker coating his own collotype plates as he does at present, the plates come prepared, either sensitized ready to be printed under a negative, or plain coated ready to sensitize in a bath of a two per cent. bichromate of potash solution. Here is the routine of the process: A sensitized plate is taken from the box, exposed in the printing-frame under a negative for two or three minutes at most, then placed under the water tap for ten minutes, drained and soaked in glycerine for fifteen minutes, all surplus glycerine blotted off, fixed to a printing bed and inked up with a printer's

roller, and then printed from, the impression being taken in an ordinary copying press. The process is admirably adapted for amateur process-workers.

Originals for Reproduction.—Always send the best copy obtainable for reproduction. A silver print is always better than a bromide, providing it is properly toned. Silver prints should be left slightly on the brown side when toning; if toned too far into the blue-gray tones they copy badly. Never fold or crease a print or drawing to be reproduced. Never write on the back of an unmounted photograph with a hard pencil or pen. If necessary to write on the back of an unmounted photograph, use a soft pencil, and write very lightly, otherwise the front is liable to be damaged by causing indentations on the back; therefore, anything written on the back shows raised on the front, and generally appears on the finished block. Never mark the surface of a print or drawing to indicate alterations; always lay a piece of tracing-paper over and mark all corrections, etc., on that. When sending unmounted photographs by post, put a stout piece of paper or card on either side, the same size as or a little larger than the print; it will prevent creasing in transit, and be a protection from the post-office obliterating stamp.

Tri-colour Filters.—The "Functions of Tri-colour Filters" was the title of a paper read on the result of examinations of tri-colour filters in the market. For experiment the spectrum was reproduced, which is the most severe test for three-colour work. Two fundamental conclusions were arrived at: (1) That since, in any photographic process, one prints from the parts of the negative where the light has not acted, or in proportion as the light has not acted, each printing colour should consist of white light, less the colours recorded through the filter. (2) That the regions where the photographic records overlap should accord in hue with the printing colours of the red and blue negatives. It was suggested that it ought not to be difficult to make a set of filters which on a good panchromatic plate would give a reproduction as good as or better than any of the commercial filters. Therefore a set

of dry filters was dyed with methylene blue, naphthol green, and scarlet, and these, when roughly adjusted, gave on a plate dyed with Miethe's ethyl red a fairly good but not perfect reproduction of the spectrum. To summarize the suggestions: (1) Printing colour should be transparent to the colours not recorded by their respective filters, and are not to be merely complementaries (except that the blue printing colour must not transmit the extreme red, which is never recorded). (2) Complete overlapping regions to accord in hue with yellow and blue printing colours. (3) Records to be without maxima (or minima) over the regions where complete record is required.

Distance of the Screen.—It will be seen that the size of the stop and the screen distance are reversible values. It is possible to find a correct size of stop for every screen distance, or a correct screen distance for every size of stop. One may use a constant screen distance and vary the size of the stop, but a constant stop would not suit every screen ruling. Further, one must vary the size of stop in order to keep the exposures fairly constant, the exposures varying with the distance of the sensitive plate from the lens. If one only varied the size of the stop, a large number of stops varying in size by a small amount would be required, and it would be difficult to estimate exposures. Hence, it is best to use few stops, and vary the screen distance to suit them. The following rules apply: (1) The screen distance increases as the camera is extended, and decreases as it is closed up. In other words, lenses of short focus necessitate the screen being placed closer; and as the camera is focused in for reductions the screen distance must be proportionately decreased. (2) Coarse screens allow of a larger distance from the screen; so do screens with thick black lines. Fine screens require closer distance; so do screens with thin black lines. (3) The larger the diaphragm opening the closer the screen must be placed to the sensitive plate. With smaller diaphragms it may be farther away. The greater the screen distance the greater is the loss of light. It is better to use the largest possible aperture, and place the screen close for rendering the high lights, but it will be necessary to give a part of the exposure with the small stop, as a large stop

would fill up the high lights before the shadows had time to act. The small stop has a good effect on shadows, concentrating the light on the formation of a sharp and small black dot.

Sizes of Screens.—150 and 133-line screens are suitable for medium quality art papers such as used for the average catalogue. A 120-line screen can be used for blocks to be printed on good quality uncoated papers. 80-line for blocks to be printed on the better quality newspapers. The cheaper the paper to work on, the coarser the grain of the screen should be. 180 and 200-line screens should only be ordered for blocks to be worked on the best coated papers.

Ordering of Blocks.—Be explicit as to measurement, if to be enlarged or reduced, and state a time for delivery if the job is not to be delayed. Block-makers are human, and will give preference to work definitely ordered to be done by a certain time. Here are two little block-ordering wrinkles: Half-size means half the area, but half-scale means half the height and half the width, or one quarter of the area. Similarly, one-third size means one-third the area, but one-third scale means one-ninth the area. The other wrinkle is this: To know what will be the exact reduced proportions of a block draw an imaginary line across the original from corner to corner. Wherever this line intersects the intended height or width of the reduction the resultant width or height (as the case may be) will also be seen.

A B C Reversing Process.—This is a brief outline of the method of producing plates. Lock the forme up in an ordinary chase, taking care that the letters are clean and free from corroded ink; an ordinary impression or proof is then taken on the transfer board, which is supplied, and it is important that this impression be even, clean, and sharp. Zinc plates are supplied already prepared (unmounted), and the proof or impression is laid on the plate and put under a press; the handle is then pulled over, held for a few seconds, leaving the printed matter transferred on the zinc; the plate is then placed in the centre of a whirler,

supplied with the outfit, the reversing enamel is poured freely over the plate, so as to cover it, after which it is whirled quickly for about half a minute in order to get the coating of reversing enamel evenly distributed on the zinc plate; after being allowed to dry, the developing solution is poured on the plate and must stand for about one minute, when, after being cleaned off and the plate dried, it is held over a gas flame or stove until the enamel turns to a violet hue; stopping out varnish is applied, and the plate is ready for etching in the trough supplied; the acid can be freely observed doing its work on the printed letters. When etched sufficiently deep, the plate is taken from the trough, cleaned with lye, type wash, or methylated spirits, trimmed round with a saw, finished with a file, and is ready for mounting on wood in the ordinary manner. A plate can be produced within an hour.

LEIMTYPIE.—This process consists in employing chromated gelatinous sheets, upon which the subject is transferred. The development is very rapid, not occupying more than from two to four minutes. It is produced by the application of a liquid which dissolves the glue not covered with work, the plate being brushed by hand or machinery. Plates with larger whites take about four minutes, to get sufficient depth, and, if necessary, the whites can be cut away as in the zinc plates. When developed, the glue or gelatine sheet is fastened on to a zinc plate in such a manner that it is impossible to separate them. This is a special feature of the invention. It is claimed that the entire block is finished sooner and costs less than the negative needed for zinco blocks. The inventor claims that Leimtypie plates render all the details of the original much more sharply than zinco blocks, because with the Leimtypie a direct transfer on to the equal surface of the glue takes place, and this reproduces with mathematical accuracy all the details of the negative. On the other hand, there is always some impurity in the manufacture of zinc which renders the development unequal. The copy of the picture takes place through albumen or some other medium, but never through zinc itself, therefore many details, as well as the character of the work, are lost.

Writing on Metals.—Take half a pound of nitric acid and one ounce muriatic acid. Mix and shake well together, and then it is ready for use. Cover the plate to be marked with melted beeswax; when cold write the inscription plainly in the wax clear to the metal with a sharp instrument. Then apply the mixed acids with a feather, carefully filling each letter. Let it remain from one to ten hours, according to the appearance desired, throw on water, which stops the process, and remove the wax.

Pictures by Wire.—An invention aiming at the transmission of portraits and other illustrations by telegraph is being tested at New York with a view to acquisition for newspaper purposes. An ordinary pin and pen, 1,000 miles apart, connected by wire, serve to conduct the illustration. The electrograph, as it is called, records its pictorial message upon a revolving cylinder; the picture to be sent is reproduced as an ordinary half-tone plate. This is flooded with melted wax and rubbed to a smooth surface. The plate is bent to the cylinder of the transmitter, the operator closes his key, and the electric current does the rest. A transmitting stylus traces a spiral upon the zinc plate, while the wax dots rapidly breaking the circuit cause electrical pulsations upon the connecting wire. These pulsations are recorded on the receivers by special electro-magnets actuating steel pens which trace corresponding spirals broken into dots upon the recording papers.

Autostereotypic Printing.—A process of so-called autostereotypic printing, especially adapted for the reproduction of books and engravings, has been invented, and is already used with advantage. The process will cheapen the reprinting of works of foreign authors, since the type-setting and copying of engravings is saved, and an accurate stereotype plate is obtained directly from the original. It is a transfer process, in which a blank, composed of plaster of Paris, silicate of potash or soda, and phosphate of lime is employed. The print to be copied is moistened in a solution of phosphate of soda in distilled water, alcohol, and ascetic ether, and is then transferred in the usual way to the plaster of Paris plate previously coated

with a film of gelatine containing citrate of iron and ammonia. After the transfer is made (all the processes thus far having been conducted in a dark room) the plate is dried and exposed to direct sunlight for fifteen minutes. When taken out, the places where the light has acted will be found to be quite hard, while at the other places the plaster is soft, and will fall off as fine powder as deep as the solution has penetrated, if brushed with a hard brush. The plate is then ready to be stereotyped.

Blue Line Printing.—The desire to print upon cyanotype paper positives from positives, that is, from black tracings, blue lines upon white ground, is now likely to be fulfilled. A positive blue paper is prepared, which combines with extreme sensitiveness the virtue of easy development, and washing out, so as to obtain distinct, sharp lines, and perfect whites. Engravers, frequently called upon to reduce large blue prints to a size requisite for illustrating catalogues or magazines, find it difficult to reduce photographically a negative blue print from dimensions of feet down to inches or half inches. On account of the forcible action of blue, the finer lines will entirely disappear in such great reductions, leaving no clue to the draughtsman, no vestige of detail to guide in the work. But, with blue lines upon white ground, it is easier to convert the deposit to a more non-actinic colour, provided that the print has been thoroughly washed. Bathing the print in an alkali, say carbonate of potash, will convert the blue to a faint yellow (sesqui-oxide of iron), which, when re-developed with tannin or gallic acid, restores the print with a reddish-brown colour, from which a photographic copy can be taken, answering the engraver's purpose, even if the whites are not quite pure.

Turning Black into White.—A sharp impression is made with ordinary letterpress-ink on good cardboard of regular postcard quality and at once covered with powdered asphaltum, which mixes with the ink. The card is then reversed and the superfluous asphaltum knocked off, so that it will stick only to the lettering to be reversed. Now pour alcohol over the back of the card, impregnating it

thoroughly. The card is then moved—at a distance to avoid the danger of burning—over a lamp or gas jet, printed side upward, and the result is that the alcohol combines with the asphaltum powder and printing-ink into a glossy relief of black colour. The card thus attained serves as a stereotype matrix and may be cast at once. The quicker the process is performed the more satisfactory will be the results. Each card allows of one cast only; but where many plates of the same pattern are used, this first cast may be electrotyped or stereotyped. It is claimed that "negative plates" made by this process have been used with advantage even for embossing, when the lettering has been deepened by a graver to suit the requirements.

Process Work in Japan.—Some work received from Tokio exhibits the adaptability of the Japanese artisan to process work of all kinds. The half-tones were made with a 133-line screen and show artistic retouching of the photograph in the first place, careful and clean etching, and finally, skilful engraving and burnishing on the half-tones. The tinting of the collotypes is so delicately done that it is difficult to determine how it is accomplished. It would appear as if the graded blues of the sky, greens of the foliage, and buff tints of the timber and roads were laid on with a sponge and stencil, while the brighter colours were put on with a brush. The charm of it all is its delicacy. Not a harsh black, white, or tint is found in any portion of the work.

Duplicating Cuts.—By placing a sheet of red, glazed paper, sufficiently large, on the copy board and the copy off to one side over it, it is easy to make three exposures on the one negative by moving the copy forward its own length for each exposure. This is quicker than exposing part of the negative at a time by manipulating the dark slide and negative, or using masks, as it is easier of access and gives equally good results. A red, glazed sheet is recommended, though black glazed will answer. Mat or flat papers of either colour, however, absorb too much light to give the best results, especially on slight reductions where long exposures are necessary. After drying, the negative

is stripped to the centre of the printing-glass and the glass covered with a sheet of tin-foil except where the negative has been stripped. A piece of zinc three times the size of the negative is then sensitized and marked off into three equal portions on the back, and the central portion exposed first, then each end in succession, which gives nine prints on one piece of metal, permitting all to be etched at one operation, a matter of economy both in negative-making and etching. This duplicate printing method will be found equally serviceable in making colour plates where the drawing permits more than one to be made from the same negative. The advantage is that colour plates from one negative cannot fail to register, and, size permitting, as many prints as the negative will produce without injury to itself can be made and etched at one time.

To Blacken Aluminum.—Here is a formula which may be tried to blacken aluminum:

White arsenic	1 ounce
Sulphate of iron	1 ounce
Hydrochloric acid	12 ounces
Water	12 ounces

When the arsenic and iron are dissolved by the acid, add the water. The aluminum to be blackened should be well cleaned with fine emery powder and washed before immersing in the blackening solution. When the deposit of black is deep enough dry off with fine sawdust and lacquer.

BOOKBINDING

HOW SEAL LEATHER IS OBTAINED.—Few people, who admire this beautiful leather, know the difficulties surrounding its obtainment. Almost every one knows something about seal fisheries, but attribute the term exclusively to the catching of fur seals. This, however, is a misconception, for a great number are employed in the quest of small seals, whose skins supply the market with leather. This fishery is carried on off the coasts of Labrador and Newfoundland. These seals are quite unlike the fur seals of Alaskan waters, differing in structure, appearance, and habits. The young of the harp seal form the principal object of capture. This seal is widely distributed about the lower Arctic regions, living on ice floes, drifting from the head of Baffin Bay to the Gulf of St. Lawrence, and also in the ice fields north of Europe and the coast of Greenland. Towards the latter part of February the seals arrive on floes, near the mouth of Davis Strait, for the purpose of bringing forth their young. Within a few days their number will run into hundreds of thousands. The colour of these seals is a whitish gray, with muzzles and part of forehead black, two broad, semicircular bands extending from shoulders to tail; from this they are also known as saddleback seals. The females usually bring forth only one whelp, although some have twins. When the young harp seal is born it is creamy white, whereas the fur seal is jet black. At birth it weighs from six to eight pounds, but, nourished by the mother, it attains a weight of fifty-five pounds in two weeks. At this stage they are in the desired condition for the hunter—the pelt is soft and weighs as much in itself as when the seal is six months old. The reason for this is, that when two

weeks old it is fat and inert, but when another week older it takes to the water and hardens in both flesh and pelt. When sighting a herd, the vessel is worked as close to the floe of the herd as possible; then hunters are landed, provided with poles or gaffs having iron hooks on one end. The mature seals scamper away into the water, leaving their progeny defenceless. The whimpering of the animals resembles that of infants and can be heard for miles. A single blow on the nose is sufficient to stun them, and as soon as they have been secured in this way the skinning commences. A cut is made from nose to tail and the skin removed with adhering fat in one piece, the carcass being left. A cargo may contain from thirty to thirty-five thousand pelts. The total catch for the fleet during the season is usually in excess of three hundred thousand skins. When the cargo is discharged on arrival, the blubber is separated from the skins and rendered into oil. The skins are salted and shipped to the different tanneries, Great Britain receiving the greatest number.

End Papers.—Binders find it necessary in these days of competition and artistic perceptions, not only to study the exterior designs of their covers, but also to consider every detail in the construction of their bindings, that each part may harmonize with the whole, and end papers should receive a fair share of consideration. However pleasing the outer cover may seem, when the book is opened, an ugly end paper will mar its general appearance almost as surely as an ink stain on light calf. Smooth delicately finished German calf does not brook a Cobb's brown or green. Yellows are so easily stained by contact with greasy leathers that they are always troublesome; and surface papers, though still holding their own on devotional work, are dull and dreary on anything else. Design papers have had a short run, but the interest they once had has died out, though some publishers retain their special designs as a trade mark stamping their own productions. Such papers could but have an ephemeral existence at best, but for good bindings they were rarely used. Marbles, however, always command a large share of favour, and none have ever been produced which for

richness and beauty can compare with the gold veined varieties. For a long time something was wanted which should not savour of the antique, and yet not be too gaudy in colour or outrageous in formation; that something has been found in the gold veined English marbles, and on work where silk would be out of place and yet something rich and tasty is required, these patterns will be found especially valuable.

Finishing and Tooling.—No tooling is to be done with pattern rolls, this being but little better than machine stamping. Any interlacing of straight or curved lines into patterns or otherwise building them up from small tools, either continuous or the forming of a certain appropriate design, worked either entirely in blind or gold, or both, with or without coloured inlays, can be termed tooled. For any one who can draw, there will be no difficulty in making up pleasing designs, even if the tools available are few. A penny wheel, or two of different sizes, a few gouges and dots will do to start with; then, if so desired, some small, simple tool can be added. For blind tooling be sure that the tools are not too hot. To size, use isinglass, dissolved in warm water, and apply with sponge after the work is dry from paste washing. Any small tools impressed, such as small lines and dots, should be in a somewhat slanting position away from the eye, or in other words, if the book is turned with head towards finisher and tool impressed with handle inclined in the same direction, the finishing will look much brighter when book is turned around into the ordinary position in which it is held when read. When all gold has been tooled in, clean off with a little benzine. If much tooling is to be done on morocco, the grain should be crushed by sponging with water and giving it a nip between perfectly smooth, planished boards.

Protest against Light Covers.—A librarian protests against the habit some publishers have of binding the whole edition of a book in white or other light and delicate shades of colour. He says that, personally, he is very often tempted to refuse to purchase such volumes, because

he knows they will be utterly ruined, so far at least as the exterior is concerned, after circulation three or four times. White is very pretty for a book intended for a wedding present, but those made for ordinary wear and tear, especially in a public library, ought to be provided with more durable bindings.

Imitation Bronze Plates for Book Covers are produced by embossing a metal-covered foundation plate, and bronzing and varnishing the surface so as to give it the appearance of old bronze or other metal. A foundation plate of paper-pasteboard or other suitable material, faced with silk, muslin, or cloth, is covered with a thin layer of metal, formed of metal leaf, metal-covered paper, foil, tinsel, or bronze powder. The plate is then embossed by means of an embossing plate into which the required design has been engraved or otherwise produced. The surface of the foundation plate is next sized and coated with pulverized graphite, bronze powder, or other metallic powder, over which a coat of varnish is placed to protect the bronze coating. The plates thus produced have the appearance of real bronze, present a handsome appearance, and can be used for a variety of purposes. By using bronze powders of different colours on the same plate a variegated effect may be imparted and the artistic appearance of the plate considerably enhanced.

Book Labels.—Amateur bookbinders would produce tasteful labels for the backs of books if they only knew how to impress the letters on the thin leather in such a way as to prevent the gold from rubbing off. To print in the ordinary manner and bronze over is useless. The best plan is this: Thoroughly beat the white of an egg, rub it thin over the place to be lettered, put on the gold leaf, and with type, sufficiently heated to coagulate the albumen, press on the leaf. Remove the surplus leaf with a tuft of cotton.

White and Coloured Foils.—The patent foils have come very widely into use for lettering and designs on paper, cardboard, and cloth. Their versatility is much in their favour, for not only do the foils greatly widen the

field for blocking, but, as they may be worked cold on platen machines, the letterpress printer is afforded further valuable facilities for obtaining very attractive effects, for instance, on cover jobs. When using these foils on paper, cardboard, or smooth cloth, no previous preparation of the material is necessary, and the foils are worked in the following manner. Lay a book of the foils between dry blotting paper, and place the lot between two strawboards damped with water; subject the whole to a slight pressure, so that the blotting paper absorbs the moisture, and transfers it in this way to the foils; by this means the foils become sufficiently adhesive to stick to the material on which they are laid. It is not necessary to leave the foils between damp strawboards longer than ten minutes after being subjected to pressure. The foils are made the size of 4×18 in., and after being damped as described, it is only necessary to open the book, cut off a piece of the foil with a gold-leaf knife to size required, and lay it on the material, cardboard, or cloth to be blocked. Being damp, the foils adhere sufficiently to the material so as not to blow off when being fed into the blocking press or platen machine, and the mere pressure of the machine combined with the heat embosses the foils so securely on to the material that it is impossible to rub off the printed surface when once it has been allowed to cool. After blocking, remove the excess foil by simply tapping the back of the material, and by brushing the surface with a light circular movement, using a medium hard brush. The work must be allowed to get cold before beginning to tap or brush. For blocking leather, silk, and similar materials, these materials must be prepared beforehand with a powder which is supplied with the foils.

Black Edges.—Books of devotion are usually bound in black leather, and the edge of course is blacked to match the cover. To give a book a neat black edge observe the following process: Put the book in the press as for gilding, and sponge with black ink; then take ivory-black, lamp-black, or antimony, mix well with a little paste, and rub on the edge with the ball of the hand till it is perfectly black and a good polish is produced. Then burnish the same as

any other coloured edge. The edges require the book to be scraped in the same manner as for gilding. To lay the colour on evenly and give it a high burnish requires more labour than gilding and is quite as expensive.

Black for Binders.—Brunswick black, thinned down with turpentine until it has attained the right tone and colour, with a little varnish added—about one-twentieth of the bulk of the black and turps. There is no difficulty in getting the mixture to dry hard.

Black Under Glaze.—Red lead, 3 parts; $1\frac{1}{4}$ part antimony; $\frac{3}{4}$ part manganese. After these have been calcined, add the following, and calcine again: 3 parts blue calx; $\frac{1}{4}$ part oxide of tin.

How to Mark Covers which are Blank on One Side.—Jog the covers carefully up on the "guide end" where fed on press, then stack them up squarely on the edge of a bench, put a weight on top, mark off one cover and fold it to fit into position as book will be when trimmed. Then use this as a pattern to mark off the others from; scratch a perpendicular line from top of the pile even distance from guide edge. This can be done with an awl or a point of a pair of compasses or a saw; the mark ought to be deep enough to form a notch in the edge of each cover when picked up. This can be used as either a folding or covering guide.

Transferring from Marble Paper to Book Edges.—Many binders who are troubled by having their marbling size turn sour, may find it to their advantage to transfer their edges from marble paper. Here is a recipe for this. After trimming the book, clamp it tightly between the jaws of the press, being careful to have the upper edges of the book to which the marble is to be transferred as even as possible; then apply albumen or egg size to the edge a little thicker than is used for finishing, making sure that the entire surface is covered. Now lay on the paper with marbled surface to the edge of the book, and with a brush apply muriatic acid on the back of the marble paper, until the figures of the marbling are plainly discernible on the

back of the paper. Then apply a damp piece of old newspaper or some soft paper and rub or pound out with the hand all wrinkles which may have formed in the edge paper. Now pull off the paper and the marble will be found on the edge of the book; let it dry for ten or fifteen minutes before opening.

Pearl Patterns on Cloth.—Flexible mother-of-pearl patterns are produced on cloth stuffs as follows: On a soft elastic base is placed thin caoutchouc as large as the pattern, and upon this a thin plate of copper, with the pattern cut through. Over the copper is placed the cloth on which the mother-of-pearl pattern is to be produced. A heater is now passed over the whole, with the result of melting the thin caoutchouc, and causing it to be pressed up against the cloth, in form of the pattern.

Do not Crowd Books on Shelves.—They should be so kindly disposed as gently to support each other. Great injury comes from their being placed too tightly together. In removing a book from its place the proper way is to loosen the books standing on each side of the one required by giving them a gentle sideward pressure; then tipping the book at the top and taking hold of the bottom, gently draw it out. This will save the backs from being broken away.

To Separate the Leaves of Charred Books.—Cut off the back so as to render the leaves absolutely independent of one another, then soak them, and dry them rapidly by a current of hot air. The leaves will then separate, but must be handled with extreme care.

Colours of Books in the British Museum.—These are all bound on a principle; historical works in red, theological in blue, poetical in yellow, natural history in green. Moreover, each part of a volume is stamped with a mark by which it can be distinguished as their property, and of different colours; thus, red indicates that a book was purchased, blue that it came by copyright, and yellow that it was presented.

A New Cover for a Writing-Book.—This is made with a pivoted rod which falls into the hollow of the book, and to which is attached an adjustable swinging-arm upon which the copy slip may be placed, which arm also serves to keep down the leaves.

Definition of Half Extra, etc.—"Half extra" is defined as books forwarded carefully and lined with marble paper, having silk headbands and narrow roll round sides, but plain inside. "Extra" or "calf extra" is when the volume is well forwarded, lined with good marble paper, has silk headbands and gilt with a narrow roll round the squares and inside the squares.

How to Treat New Books.—Always open a book in a gentle manner, especially one newly bound; never confine the leaves with the points of the thumbs: in doing so it breaks the back. Lay it upon a flat surface and open it lightly, pressing upon the open leaves, and taking a few sheets at a time; go through the book until the requisite freedom is obtained.

Glass for Paring On.—Use a piece of glass instead of marble; it is much to be preferred. A piece of heavy plate-glass is the best, as it will not break so easily.

To Polish Old Bindings.—Take the yolk of an egg, beat it up with a fork, apply it with a sponge, having first cleaned the leather with a dry flannel.

Restoring Colour to Old Books.—Old printed matter which has turned yellow may be made white by first washing carefully in water containing a little hyposulphite of soda, and afterwards dipping in Javelle water for a few minutes.

Bound Volumes with Ornaments.—Never place books with clasps or carved sides on shelves. They mark and scratch their neighbours.

Cut *v.* Uncut Edges.—Why do publishers issue books with uncut or unopened leaves is a question which frequently arises in the minds of those who have the trouble

of cutting the pages of a new volume. The origin of the custom is plain. In days long ago, when books were chiefly bought by bibliophiles, the cloth binding, or paper cover, was simply regarded as a temporary cover, as every book collector looked forward to the time when he would be able to have his library bound in leather; otherwise the book would be so cut down as to be unsightly. Every bibliophile loves wide margins, and the book-buying public should be educated up to that taste. Booksellers prefer uncut volumes because they look bigger and make a more showy appearance. It is impossible for loungers in book stores to soil the pages of uncut works, for the man who wants to read one must buy it. Publishers endeavour to meet the wishes of all, and therefore some issue both cut and uncut books. Some publishers find that the public like books uncut because they look more artistic. If the books were trimmed they would have to be pressed and would look much smaller. Other publishers find that cut edges are popular for magazines, paper-bound stories, novels, library books, and cheap editions generally, but for books printed on antique paper the cutting of edges would be a sin. Everything depends upon the character of the volume to be published. Again, to most men the purchase of a book is an event and they enjoy cutting the leaves. Because an uncut book looks large the public think they are getting value for their money. Where some publishers make a mistake is in lack of unity in designing a volume. They produce a book with a neatly covered border and uncut edges, or with a bold striking cover and edges uncut. Some people prefer uncut edges; others prefer cut edges because they are saved further trouble and trimmed volumes appeal to their sense of neatness and tidiness.

The Covers of Books.—The question of binding comes after all the other questions have been settled. It shall not be panelled russia, for russia leather does not last, but it may be crushed levant, morocco, or vellum over the original paper wrappers and the original cloth covers detached from their boards, or the cloth-covered books may remain untouched. The binding may be half binding with corners, or half binding without corners, or full binding;

and in Jansen (short for Jansenist) style, which is without an ornament, or *à la fanfare*, which is a pretty style of ornamentation, and in one or varied colours. It is not heresy in bibliolatry to give an English book to a French bookbinder, or the reverse, and an American bookbinder loves his art enough not to let his Chauvinism make ungraceful work for "American Notes." The only recommendation which it would not be pedagogic to make to a collector may be that a book in half binding should have uncut edges, and a book in full binding must have gilt edges, even if the binder finds its necessary to cut them a little. The paper covers of a book are kept because they are often illustrated, were part of the book's physiognomy, or made its fortune, and contain useful information for bibliographers. The French led the fashion with their first collections of books written by romanticists, the covers of which had ghostly vignettes by Deveria and the Johannots, and magnificent promises of great works by Hugo, Gautier, Balzac, Lacroix, and the rest, a catalogue of which would make an interesting volume on "Books Announced, but Never Published."

Appropriateness of Bindings.—The binding of a book should always suit its complexion. Pages venerably yellow should not be cased in military morocco, but in sober brown russia. Glossy hot pressed paper looks best in vellum. The costume of a book should be in keeping with its subject and with the character of its author. How absurd to see the works of William Penn in flaming scarlet, and George Fox's "Journal" in bishop's purple. Theology should be solemnly gorgeous; history should be ornamental, after antique or gothic fashion; works of science, as plain as is consistent with dignity; poetry, *simplex munditiis.*

Handicraft Workshops and Bookbinding.—A number of men and women have taken up bookbinding apart from their regular vocations, and a few are meeting with success. It must, however, be borne in mind that no effective work can be done in this line by a devotee, however enthusiastic, unless the mechanical process of forwarding be thoroughly mastered. To spend all the time and

endeavours on the outside decoration and neglect the most essential requirements is sheer folly. A book well made in every detail, say three-quarters leather, harmonious in colouring of back and sides, freely opening and free from lumps in joints and "turn-ins," smooth covers and sharply rubbed-up, straight bands, does not need its back covered with embellishments; it has a beauty and a dignity all its own. If the lettering is straight, clear, and type well selected, it will commend itself to any booklover.

A Cheap Binding.—Pack the papers smoothly, hold firmly, and drive a thin chisel through the pile about half an inch from the back. Push a strong tape through and leave out about two inches; put three or four tapes through at even intervals. Cut common thick paper boards large enough to project a little everywhere, except that one edge must come in front of the tapes. Draw the tapes tightly, and glue down to the boards outside. Skive a piece of leather—common sheepskin will answer—wide enough to cover the back and come on the boards an inch or two, and long enough to project a couple of inches at the end. Paste the leather well; put it on the back; fold the ends in so as to come over the boards on each side. Paste any fancy or plain paper over the sides; and, lastly, paste the blank leaf down to the cover inside, and you have a presentable book, and very durable. Trimming the edges can be easily done by clamping between boards and cutting the edges with a thin, sharp knife by a straight-edge. This is done before the boards are put on, after the tapes are in. This makes a flat-edged book, but for a thin book answers very well.

Pellisfort Binding.—Instead of the ordinary boards metal plates are used, which for many reasons are very much better. The covers are flexible and yet strong, and will not curl up even if the book be read close to the fire, and they also resist damp. A better finish, it seems, is given to books bound in this style. The leather lies flatter and the gold looks brighter. Many people prefer limp binding, and this "Pellisfort" style of binding not only gives limpness, but strength and elegance combined. An-

other excellent feature in bound books is a place made in the inside of the front cover for a photograph, which for presentation volumes is a capital idea.

Wood for Binding.—A novelty has been introduced in bookbinding—the substitution of walnut, maple, mahogany, sycamore, and cedar for the covers of reading-cases, music-books, and large volumes, in place of the usual leathers, muslins, or papers. The examples submitted in gothic binding of this kind contrast very favourably, both in cost and appearance, with the ordinary leather, and seem likely to be well received for table-books, folios, and albums. The several woods, which take a high degree of polish, are prepared to resist stains and damp, and the cost, it is said, does not exceed that of leather binding.

Waterproof Binding.—A waterproof material, designed as a substitute for bookbinders' cloth or leather, is made by treating fibres of linen, cotton, jute, wool, wood, cellulose, etc., as well as the waste from the treatment of such fibres or cellulose, with a solution of albumen, which solution may be applied superficially or throughout the mass. To this solution is added glycerine, to render the coagulum formed ductile, and a solution of metal salt for the purpose of increasing the capability of coagulation, and for preserving it against the action of water; and, to impart to the material the strength of leather or stiff paper of strong quality, basic borate of soda is added. The solution of albumen thus prepared is brought into coagulation, and the whole is pressed in an appropriate manner between heated rollers or cylinders, which may have smooth or engraved surfaces as desired. Instead of using fibres as described, woven material or paper may be employed, using the same process, roughening the surfaces of the material to facilitate the adhesion of the albumen and keep the coagulum on the surface.

A Strong Binding.—The following method of binding books liable to rough usage has been suggested. After the sheets have been folded, collated, and pressed, they are glued on the back. The blank paper, glued inside on both

parts of the binding boards, receives linen folds. After these blank papers have been glued or pasted, the book is trimmed on the three sides and a board-lap glued along the back. The book is then glued into its binding. The holes for the rivets are punched by a machine, and little metal plates placed along both sides of the back of the book are riveted with wire having little heads. The sewing of single sheets, which involves great loss of time, is done away with in this binding.

Bindings for Library Books.—A writer on the subject raises an objection to the fashion of pasting paper title panels on the backs of such books. He finds fault with the practice of using leather for this purpose, and claims that all library books should have their titles stamped in gold on the cloth or leather of the back itself, so that no matter how roughly used the book does not lose its identity. Should the volume be too thin for horizontal lettering the title may be run lengthwise.

Cleanliness in Binding.—In the matter of binding, and especially in finishing, the importance of cleanliness cannot be over-estimated. The excellence of design and the good handling of tools will be lost entirely on a volume of sloppy or dirty appearance.

To Restore the Gloss of Fine Bindings.—These may be restored by using a preparation of Canada balsam and clear white resin, six ounces of each, dissolved in one quart of oil of turpentine.

New Method of Bookbinding.—It may be interesting to note a new method of bookbinding, an improvement in the custom of sewing signatures of the book without being previously saw-cut or notched; the operation is accomplished by placing threads in the folds of each separate signature, passing the threads through the folds of the signatures in four or more places by punches which form the thread into loops, through which needles pass threaded with twine or binding cords for securing the signatures together; the internal threads at each end of each signa-

ture are then cut off and the ends of the threads passed through the folds of each signature near their ends and tied securely around a thread or small binding cord, thus making a permanent binding.

The Harleian Style of Binding.—This takes its name from Lord Harley, Earl of Oxford, who, at his death, bequeathed his library to the University of Oxford. The books are principally bound in red morocco, raised bands, tight backs, marble ends, and gilt edges. The finishing is a broad tooled border with centre panels.

Preservation of Bindings.—Bookbindings become deteriorated in many ways. If they become stiff and rigid, vaseline is good, especially for those bound in calf and morocco. It leaves no trace of its existence to either smell or touch a few hours after its use.

Persian and Turkey Morocco.—It is said that Persian goat or morocco is the skin of a kind of wild goat raised in East India, and tanned in a species of bark native in its own country, and then shipped to London, from which place it is sent to all parts of the globe. Turkey morocco is a goat-skin raised in Switzerland and sent to Summac, Germany, for tanning, and is a finer grade of goods. Bock leather is a sheep-skin, also raised and tanned in East India.

Pig-Skins for Bookbinding.—At one time, before morocco came into general use, pig-skins were largely employed for bookbinding. One reason why they fell into disuse, probably, was their cost, but this is no longer an impediment. Pig-skins are tanned by an old-fashioned and somewhat tedious process, but it has the advantage of turning them into a leather of extraordinary toughness and durability, which is all but impervious to atmospheric influences. Pig-skins, or, as they are named by the tanners, hog-skins, for the use of bookbinders, are in a variety of shades, and are worked up into a very beautiful grain, something like a large grain morocco in appearance. Their cost is a little below that of calf, so that they fall quite

within the limits of expense as materials for bookbinding. Appearances are greatly in their favour, and whether for library bindings, where strength and durability are the prime considerations, or for fine bindings, these hog-skins seem equally well adapted. Hog-skins would be very serviceable for account-book bindings, particularly for hot climates. In India and elsewhere hog-skins have long been preferred to other leathers for certain purposes, on account of their lasting qualities, and similar considerations may be expected to operate in their favour for bookbinding.

Cement for Leather.—Not every bookbinder may be aware that gutta percha dissolved in carbon disulphide until it is of the consistency of treacle forms a very good cement for splicing leather. The parts to be joined must first be thinned down, then a small quantity of the cement is poured on each end, and spread so as thoroughly to fill all the pores of the leather. The parts are next warmed over a fire for a few minutes, joined quickly, and hammered well together.

Artistic Leatherwork.—Productions in leatherwork are becoming more interesting, owing to the fact that articles are now made from leathers never before heard of. The skins of sharks are now being tanned, bleached, and polished until they shine and glisten like flint or granite in the sun. Snake skins, with scales and their beautiful natural markings preserved by means of alum curing, are now to be had. Lizard and frog skins are prepared both in their natural colours and dyed in darker hues. Sea lions' skins have been found to possess merits in their queer, irregular markings, owing to the animals wriggling over the ice; the skins may be tanned, rubbed, and polished ever so much, yet these curious wavy lines can never be obliterated. The scales of the Florida bone pike have been used with fine effect to decorate shark skin. These scales are lustreless and of a pale brown colouring, somewhat like Chinese characters, and, when inlaid so as to overlap, forming borders or designs, greatly enhance the highly polished surface on which they are

laid. Decorating leather is not a new art, it having been practised to a high degree in the Middle Ages. The Cordova leatherworkers gained as much fame in this art as the weavers of Flanders in textiles, and the Walloon smiths in wrought iron.

Gilding Leather.—Damp the skin with a sponge, and strain it tight with tacks on a board. When dry, size it with clear double size; then beat the whites of eggs with a wisp to a foam, and let them stand to settle; then take books of leaf silver and blow out the leaves of the silver on a gilder's cushion; pass over the leather carefully with the egg size, and with a tip-brush lay on the silver, closing any blister which may be left with a bunch of cotton. When dry, varnish over the silvered surface with yellow lacquer until it has assumed a fine gold colour. The skin being thus gilded may be cut into strips or patterns. Be careful to have the skin well dry before sizing it. Bookbinders gild the edges, etc., of leather in a different way. They first go over the part to be gilded with a sponge dipped in the glaire of eggs (the whites beaten up to a froth and left to settle); then, being provided with a brass roller on the edge of which the pattern is engraved, and fixed as a wheel or roll in a handle, they place it before the fire till heated, so that, by applying a wetted finger, it will just hiss. While the roller is heating they rub the part where the pattern is to come with an oiled rag or clean tallow, and lay strips of gold-leaf on it, pressing it down with cotton; then with a steady hand they run the roller along the edge of the leather, and wipe the superfluous gold off with an oiled rag, and the gold adheres in those parts where the impression of the roller has been made, while the rest will rub off with the oiled rag.

Leatheroid.—This consists of a number of thicknesses of cotton paper wound one upon another over a cylinder. It possesses remarkable qualities of strength and adhesion, derived from a chemical bath through which the paper is drawn on its way to the cylinder. Leatheroid, for the purposes it now serves, consists of about twenty thicknesses of paper; it is shaped upon or around moulds, while wet,

into the form it is to represent, and will hold that form perpetually when dry. When dried, it is as difficult to cut with a knife as raw hide. A company has been formed for the manufacture of this article into seamless cans, boxes, etc., to take the place of tin and wooden goods. Cans made from it are about one-fourth the weight of tin cans of equal size. Cans made from leatheroid have the elasticity of thin steel, and no amount of handling will break them.

Embossed Leather.—Many persons are engaged in collecting old boots and shoes, which they take to certain factories, for which they are paid. Calfskin boots bring the best price, while cowhide ones are not taken at any figure. These boots and shoes are first soaked in several waters to get the dirt off, and then the nails and threads are removed and the leather is ground up into fine pulp. Then it is pressed upon a ground of heavy paper, to be used in the manufacture of "embossed leather." Some people think they are going away back to mediaeval times when they have the walls of their libraries and dining-rooms covered with this, and remain in ignorance that the boots and shoes which their neighbours have thrown away now adorn their walls and hang on the screens which protect their eyes from the fire. Carriage-top makers and bookbinders also use the material made from old boots and shoes, the former for leather tops for carriages and the latter for leather bindings for the cheaper grade of books. The new styles of leather frames, with leather mats in them, are entirely made of the cast-off boots and shoes.

Restoring Leather Bindings.—Mildew, shown in the form of roundish or irregular brown spots, cannot be cured, but may be effectually checked by thoroughly drying the volume and afterwards keeping it in a dry place. Leather bindings of old books will frequently be found to be dilapidated. If broken, rubbed, or decayed, fill up the crevices with paste, then take the yolk of an egg, well beaten up, and apply to the leather with a sponge, having first cleansed it with a dry cloth. A hot iron passed over it gives a polished surface. Stains of any kind may be

removed either from the leaves or the cover of a book. For common writing ink use a mixture of spirits of salts and water in the proportion of one to six. A solution of chloride of lime is also good. In both cases the part should be subsequently well washed with clean water. Grease or wax spots are removed by holding a hot iron close to the place affected, or by washing with ether or benzine. By th atter process it is advisable also to use the hot iron. The remedy against oil stains is sulphuric ether. Roll up the leaf to be operated on, insert it in a flat-mouthed bottle half full of the ether, and shake it quietly up and down for a few minutes. On removal the stains will have disappeared; the ether rapidly evaporates from the paper, and rinsing in a little clear water finishes the job.

Gold Leaf.—This material was used in ancient times, for the Egyptians ornamented with it their furniture and sarcophagi, on which the gold is still to be seen. Their gold was beaten out between the caecum or membrane of the intestines of an ox, whilst the Greeks and Romans employed parchment. In all succeeding times the practice of beating out the leaf between parchment has never been departed from, and nothing has been invented to supersede hand manipulation in bringing the leaf to a high degree of thinness. From 150,000 to 200,000 leaves make an inch in thickness. The tints of gold leaf vary from deep orange red to a pale silvery hue. Pale leaf gold is an alloy of silver and gold; deep hues are usually intermixed with a slight amount of copper. Dutch gold is copper leaf coloured yellow by the fumes of molten zinc. Various solutions are used to alter the tint of gold leaf when laid. The best gold leaf is prepared from gold containing one and a quarter per cent. alloy of copper. Gold with its alloys is first cast in ingots, then rolled into sheets, which are cut into squares and subjected to the hammering process on the anvil. First the plates are extended to the size of the packs, four inches square, are again cut in four pieces and again hammered. A third hammering is given to the pieces when they have reached the size of the pack and been subdivided. The 150 pieces with which the hammering commenced are now increased to 2,400. The process of ham-

mering is long and tedious, and requires the nicest determination of the force and direction of the blows. The anvil itself is convex at the top; so also is the hammer. When the sheets of metal have attained a certain thinness they are placed between the prepared skin. The beater never strikes consecutively in the same place. A sense of feeling as well as observation is required to ascertain when the metal is sufficiently thin.

Gilding Edges of Books.—After the edges have been cut, wash them with a compound of four parts of Armenian bole and one of candied sugar, ground together till of the consistency of water. Add the white of eggs and the same quantity of water. Beat the whole together and apply it with a camel-hair brush; when nearly dry, burnish the surface. Then slightly moisten with wet sponge and apply the gold leaf with a piece of cotton wool. When dry, again burnish it, interposing a thin piece of paper between the gold and the burnish.

Gilding upon a Marble Edge.—The book, being scraped the same as in gilding, is marbled in a desired style and put into the gilding-press in the same manner as an ordinary book for gilding; it is then burnished, the size being lightly applied immediately, care being taken not to destroy or unsettle the marble, and then is finished off in the ordinary way, after which, when properly done, it makes as fine an edge as one would wish to see, the marble showing through the gold.

Gilding a Book Red under Gold.—Screw up tightly between boards and carefully and evenly scrape the edges; put red on with a sponge, fanning out the fore-edges right and left; when dry, size with the following: the white of a good-sized egg beaten up thoroughly, and a teacupful of water, beat up, and strain through a piece of fine muslin, damped. Lay this on lightly, not disturbing the red, then lay on the gold; let it thoroughly dry. Place a piece of paper on the edge, one side of which has been passed over the head so as to grease it slightly, on that side press with the burnisher, moving over the whole surface. Then burnish with an agate.

Gilding on Water-Coloured Edges.—This is an edge which not only pleases the eye but is hard to execute. After the edge is well scraped and burnished, the leaves on the fore-edge are evenly bent in an oblique manner, in which position boards are affixed on each side until the design is painted, according to fancy. When dry, the boards are untied and the leaves take their proper position. The book is then placed in the gilding-press, and the size and gold are laid on, and when dry burnished. The design will not be apparent when the book is closed, because the gold covers it; but when the leaves are drawn out it shows up readily, the gilding disappearing, and a very unique effect is produced. The time and labour required make this operation expensive, and it is consequently very seldom done. However, the taste and wishes of some render it necessary that the gilder should know how to operate.

Stamped Leather Boards.—Stamped leather boards are being produced by a new process. An extensive selection of samples has been shown bearing various patterns in network and geometrical figures. The stamping comes out in sharp relief, and the colour of the leather is also well reproduced. The boards are smooth on the back so that they can be as easily worked up as ordinary boards, and the price, at the same time, is only a trifle higher. For boxes, portfolios, cases, and similar cardboard work they will probably become a useful material.

To Gild Edges of Cards.—Put the cards together so that the edges are perfectly even. Then place in a press with the edges uppermost. Coat the edges with a mixture of red chalk and water. The gold leaf—preferably of thin quality—is blown out from the books and spread on a leather cushion, where it is cut to the proper size with a smooth-edged knife. A camel-hair pencil is dipped into white of egg mixed with water, and with this the partially dry edge is moistened; the gold is then taken up on a tip-brush and applied to the moistened edge, to which it instantly adheres. When all the four edges have been gilt in this way, and allowed to remain a very few minutes,

take a burnisher formed of a smooth stone (usually bloodstone) and rub the gold quickly till it receives a high degree of polish. For silver edges take a brush, dip it in a saturated solution of gallic acid, and wash the edges; then brush with a solution of 20 parts nitrate of silver to 1,000 parts distilled water. Alternate these solutions until the edges assume a brilliant tint. Then wash with distilled water and dry by free air and heat.

A Chaste Binding.—Gold on imitation parchment or white cloth gives an extremely refined look to a book.

Definitions of Sizes.—Nine persons out of every ten have but a vague idea of the meaning of "folio," "quarto," "octavo," and the rest. A folio book is the largest, an octavo the smallest of the three, most people would say. But, strictly speaking, the terms indicate that a given sheet has been folded a given number of times. Prior to the middle of the eighteenth century the watermarks on papers at once showed the size of the sheet. The smallest sheet, marked with a jug, was known as "pot"; the next had a cap and bells, hence our "foolscap"; others bore a horn, "post," a crown, and so on. To-day the words folio, quarto, etc., are sometimes loosely used to indicate the size of the pages, irrespective of the number of times the sheets have been folded. A folio—whether of imperial size, 30 in. by 22 in., or merely post, $19\frac{1}{4}$ in. by $15\frac{1}{2}$ in.—is a book wherein the sheets have been folded once only; in a quarto they are twice folded; in an octavo three times; in a 16mo four times. Thus we know immediately that in a "crown octavo," a sheet, measuring something like 20 in. by 15 in., has been thrice folded. Each sheet bears a "signature"—*i.e.*, small letters or figures at the foot of the first page and sometimes on the third page as well—and this is the true method of discovering how many times the paper of a certain book has been folded.

Edges of Books.—There is not always a clear understanding as to the terms used in connection with the treatment of edges. "Uncut" does not necessarily mean that the edges have not been opened with a knife, but simply that the book has not been cut down by machine, a method

which sometimes sadly mars the appearance of a book. The expression "unopened" is perhaps a stricter term to be applied when absolutely untouched. "Trimmed edges" means that the heads have been left untouched, and the fore-edge and tail merely trimmed sufficiently to make them tidy. "Cut edges" means that a portion has been cut from the three sides of the book.

Gilt-Top Edges.—An amusing opinion on the style of binding with gilt-top edges was sent to a German bookseller from a customer in Chili, who wrote to him that "only one side is gilt and cut, the other two are neither cut nor gilt, whereby the volume seems extremely negligently done."

Red Edges.—To obtain a bright and lasting red edge take the best vermilion and add a pinch of carmine; mix with glaire, slightly diluted. Take the book and bend over the edge so as to allow the colour slightly to permeate it; then apply the colour with a bit of fine Turkey sponge, bend over the edge in the opposite direction, and colour again. When the three edges have been done in this manner, allow them to dry. Screw the book tightly up in the cutting-press, and after wiping the edge with a waxed rag, burnish with a flat agate.

Colour for Red Edges.—A very pretty red edge can be made of Chinese vermilion and eosine mixed. First dissolve the vermilion in the usual way and then add the eosine powder—about half as much eosine as vermilion—and when burnished the edge will have a gilt or metallic cast.

Margins of a Book.—The four sides of a printed page in a book are called head, tail, fore-edge, and back.

Morocco Leather.—This is made from goat-skins, tanned in sumach, dyed in the ordinary way, having been previously immersed in a solution of sulphuric acid. The grain is stamped upon it by hand or machinery, similar to that employed for the purpose of dicing or graining. Very

fine small skins for gloves are often prepared by immersion in a solution of alum and salt, instead of tannin, flour and the yolk of eggs being afterwards applied to soften and whiten. Buff leather, not now so much in request as formerly, was at first made from the skin of an animal called the buffe, or urus, which was then common in Western Europe. When new the leather was always a tawny yellow, and the skins gave the name to the colour. Cordovan leather was first made at Cordova in Spain, from hides dressed to be used with the grain side outward. It was from this leather that the title "cordwainer" came. Russia leather is tanned in an infusion of willow or birch bark, and derives its peculiar and long-enduring odour from the birch oil with which it is dressed. Levant leather is first struck out in warm water on a mahogany table, blacked with logwood and iron liquor, then polished by revolving rollers, and grained up by the workman with a corking board on a table. The grain is set into the leather in a hot stove, and after this it is oiled with cod oil. In finishing japanned leather the japanned mixture is worked by the hand alone. This mixture consists simply of linseed oil and Prussian blue, the last coat being of linseed oil and lampblack, put evenly over the surface as it lies spread out on a table. No machine has as yet been made to supersede the hand in this part of the work. In the blacking of skins a mixture of ox blood and acetate of iron is often used.

To Restore Morocco.—The lustre of morocco leather is restored by varnishing with white of egg.

Use Good Thread.—The sewing is the foundation of bookbinding, therefore the thread should be of the best quality; the cords upon which the book is sewn, and so to say build sheet to sheet and sheets to boards, should be of good hemp and of long fibre.

To Clean Old Engravings.—Prints may be either damp-spotted, greased, stained, worm-eaten, or discoloured by smoke and surface dirt. The only dry method in use is that of gently rubbing with stale bread; this will remove much of the surface dirt, but not stains. The chloride of

lime process is as follows: Place the engraving, face upwards, in a shallow dish (wooden ones having glass bottoms are usual); pour on a weak solution of chloride of lime (about 1 part to 30 parts of water), and watch closely. Touch obstinate stains with a camel-hair pencil charged with a stronger solution. When all stains are removed, the print must undergo a thorough rinsing with water over the entire surface. When the print has a mounted tint, the water must be gently and evenly floated on from the middle of the engraved surface; otherwise the edges of the tint may rise.

To Preserve Bindings from Mildew.—The bindings of books may be preserved from mildew by brushing them over with spirits of wine. A few drops of any essential oil will secure bindings from the consuming effects of mould and damp. The leather which is perfumed with the tar of the birch-tree never moulds or sustains injury from damp or insects. The Romans used oil of cedar to preserve their manuscripts. Russia leather placed in the window will, it is said, destroy flies.

Preserving Records and Books against the Attacks of Insects.—It has been proposed: 1. To abolish the use of any wood in the binding processes. 2. To recommend the bookbinder to use glue mixed with alum in place of paste. 3. To brush all worm-eaten wood in the repositories of books with oil or lac-varnish. 4. To preserve books bound in calf, it is recommended to brush them over with thin lac-varnish. 5. No book to lie flat. 6. Papers, letters, documents, etc., may be preserved in drawers without any danger, provided the wafers are cut out, and that no paste, etc., is between them. 7. The bookbinder is not to use any woollen cloth, and to wax the thread. 8. To air and dust the books often. 9. To use laths, separated one from the other one inch, in place of shelves. 10. To brush over the insides of bookcases and laths with lac-varnish.

Protection against Cockroaches.—These insects are known to be great destroyers of books in the ravages they make upon the bindings. Roaches will not touch books

which are varnished with a mixture of one part copal varnish and two parts oil of turpentine. With a large brush paint this over the cloth binding, and let the book stand to dry. It cannot be applied to the edges, unfortunately, but it is something to know that it will save the other parts of the book.

Remedy for Wood-worms.—Benzine will destroy wood-worms in books and woodwork. The insects, as well as their larvae and eggs, will soon die off if a saucer of benzine is placed in the bookcase and the doors kept closed. Furniture and carvings infested with wood-worms are similarly placed in a room with a dish of benzine, and kept closed up for a sufficient time.

Another Remedy.—The best method of putting a stop to the depredations of bookworms is to take equal parts of powdered camphor and finely chopped tobacco, and then to sprinkle this mixture over the shelves. This operation should be repeated every six or eight months.

Inlaying of Leather.—Inlaying is the finest art of the bookbinder, and each one thinks his own way the best. The use of the soft Spanish morocco is recommended, which should be pared as thin as possible, then lined with thinly pasted tissue paper, the reversed design should then be worked on the paper, and the pieces cut out with a sharp knife on a thin plate of zinc. When pasted, great care must be taken in lifting to prevent stretching. When put on, they must be firmly rubbed down and into the design, the two ends at the corners overlaid, and both cut through with a sharp knife, care being taken not to leave a frayed edge.

How to Insert a Leaf in a Book.—Most men when they want to insert a leaf in a book put mucilage on both sides of the leaf's inner edge, put it in the desired place, shut the book and let the mucilage dry. Afterwards, when they come to use the book, they find it hard to read the words at the very inside of the pages, and later on they wonder why that leaf will not stay stuck in. The trouble

is that they went to work in the wrong way. The difficulties can be obviated very easily. When it is needful to insert a leaf, turn over a third or a half-inch of the edge of the paper. Put the mucilage only on the outer side of the little flap thus made, taking care to get none on the rest of the paper. Then insert the leaf and shut the book. When it is opened, if the outer edges of the sheet have been trimmed, it will be found to all intents and purposes a new leaf, as flexible and durable as any other in the volume.

Dust.—The old binders regarded dust as one of the worst enemies of their books; hence their efforts to exclude it by various devices, such as leather coverings which met all around when the book was closed; heavy metal clasps to hold the book tightly shut, and leather thongs to serve the same purpose. To the modern book dust has lost some of its terror. With its thin, smooth paper a well-made modern book closes very tightly, and if its edges have been skilfully gilded it is next to impossible for dust to gain admittance. But there is no need to encourage it by only partially filling a bookshelf. See that your books when standing up are always close enough together to keep the dust out.

Mildew in Books.—Books should be kept in a warm and dry place, otherwise they will become speedily mildewed. The mildew shows itself in the form of roundish or irregular brown spots, and cannot be cured. After the process has once commenced it can only be checked by the utmost attention to dryness.

A Preventive against Dampness for Books.—Quicklime is said to be the best thing to save books from the ill effects of damp. A small vessel full of lime placed near a bookcase is better than a blazing fire for this purpose. The lime, which absorbs every particle of moisture in the atmosphere, must be changed every two or three days.

Keep Books Clean.—Books in a library should be thoroughly dusted two or three times a year, not only to keep them in all their freshness, but also to prevent any

development of insects, and to examine for signs of dampness. The interior of a book also asks that care which unfortunately is neglected very often. After having taken a book from the shelves it should not be opened before ascertaining that the top edge is not covered with dust. If the book has had the edge cut it should be dusted with a soft duster, or the dust simply blown off. If it is a book with uncut edges it should be brushed with rather a hard brush. By this method, in opening a volume one need not be afraid that the dust will enter between the leaves and soil them.

Stained Books.—If a book is much stained it may be cleaned in the following manner: Take the book to pieces, lay a few pages in an earthenware dish and press on them some boiling water, then take them out and lay them between clean blotting paper till dry. A drop of muriatic acid may be used, but care is required.

A Remedy for Soiled Books.—Dirt may be taken off book-leaves, without injuring the printing, with a solution of oxalic acid, citric and tartaric acid. These acids do not attack printing-ink, but will remove marginal notes in writing-inks, etc.

Imitation Leather used for binding cheap account books and other purposes is manufactured thus: A piece of cotton texture is passed between two cylinders, the upper one of which permits a mixture consisting of oil, resin, lampblack, and other matters to flow upon the slowly moving canvas. From the cylinders the fabric is wound up on a drum made of wooden sticks so arranged that the successive layers are kept apart from one another. When the whole piece has been wound up on the drum, the latter is placed, with the oiled cloth on it, in a drying chamber. After drying, the cloth is smoothed by means of pumice-stone, and passed a second time through the cylinders, receiving another coating of varnish. It is then dried, and these alternate operations repeated at least five times, in order to make the coating sufficiently thick. The final process is pressing the cloth in such a manner as to give it the appearance of natural leather.

Another Imitation Leather.—A substitute for rough calf or other skins used in bookbinding has lately been invented. Vellum cloth or some other suitable fabric is coated with an adhesive substance, such as is used in making flock-paper, and before this substance becomes dry, flock is dusted upon it. The resulting fabric resembles rough calf or other leather; the effect can be varied according to the particular dye previously applied to the flock.

Imitation Leather Surfaces.—By means of electricity the most attractive leather surfaces are now completely imitated. The leather which it is desired to imitate is first well cleaned and coated with graphite, as in electroplating a small article. It is then placed in a copper-bath, the tank of which is large enough to receive a skin of any size. A dynamo-electric machine generating a powerful current furnishes the electricity. The copper is deposited upon the coated surface of the hide to a thickness of from one-sixteenth to one-eighth of an inch. The plate thus formed reproduces, but reversed, every mark and minute vein of the leather, so that a print taken from it is an exact copy of the original.

Repair Broken Bindings.—Money will be saved by rebinding before the edges of the outside leaves become turned up, creased, or torn off. Especially should old books be watched very carefully. Do not remove the old bindings, but repair them skilfully. If the outside leaves have become rumpled, dampen them carefully and press them by subjecting the book to considerable pressure, first placing plain white paper between the dampened sheets themselves and also between them and the dry ones.

Preserve Old Writings, etc.—Never destroy old writings or autographs; nor destroy old bookplates. If necessary, remove them to the end board. Before destroying old bindings examine them for rare leaves or woodcuts of little value in those days, but now, perhaps, curious and valuable.

Preserve Original Bindings.—Never destroy an original binding upon an old volume if the binding be in tolerable condition. An old book should not be rebound, unless it is essential to its preservation, and then as far as possible it should be a restoration. In some instances to re-bind a book is simply to spoil it, for many volumes derive their value from the curious character of their binding only, and this is observable in specimens of typography issued from the earlier presses.

To Restore Faded Writing.—The faded ink of old parchments may be restored, so as to render the writing legible, by moistening the paper with water and passing over the lines of writing a brush wetted with a solution of sulphide of ammonia. In the case of parchment the colour will remain, while in that of paper it will gradually fade, the explanation of the chemical action being that the iron, entering into alliance with the ink, is transformed by re-action into a black sulphate.

Sizes of Books (Uncut Edges).—Books with uncut or merely trimmed edges should measure in inches:

	Octavo.	Quarto.
Pot	$6\frac{1}{4} \times 4$	$8 \times 6\frac{1}{4}$
Foolscap	$6\frac{3}{4} \times 4\frac{1}{4}$	$8\frac{1}{2} \times 6\frac{3}{4}$
Crown	$7\frac{1}{2} \times 5$	$10 \times 7\frac{1}{2}$
Post..................	8×5	10×8
Demy	$8\frac{3}{4} \times 5\frac{5}{8}$	$11\frac{1}{4} \times 8\frac{3}{4}$
Medium	$9\frac{1}{2} \times 6$	$12 \times 9\frac{1}{2}$
Royal	$10 \times 6\frac{1}{4}$	$12\frac{1}{2} \times 10$
Super Royal	$10\frac{1}{4} \times 6\frac{3}{4}$	$13\frac{3}{4} \times 10\frac{1}{4}$
Imperial	$11 \times 7\frac{1}{2}$	15×11

Other sizes are a matter of further subdivision. These dimensions are not for books with cut edges, but it is safe to allow a quarter of an inch less in height, and not quite so much in width, if the edges have been cut down, always assuming these edges have not been cut more than once; otherwise, if the book has been rebound more than on one occasion, no reliance can be placed on this rule.

THE DIFFERENCE BETWEEN FOLIOS, QUARTOS, ETC.—To determine the real size of a bound book, wrote William Blades, find the signature and count the leaves (not pages) to the next. A further test is the binder's thread in the middle of the sheet: the number of leaves from each thread to the next will give the same result. But these rules do not apply to the old black-letter books and those of the fifteenth and sixteenth centuries, in which the most satisfactory test is the watermark. The rule is: a folio volume will have all the watermarks in the middle of the page; a quarto has the watermark folded in half on the back of the book, still midway between the top and the bottom; in an octavo it is at the back, but at the top, and often considerably cropped by the binder's plough; and a 12mo and 16mo have the watermark on the fore-edge.

SOME BIBLIOGRAPHICAL NAMES OF BOOKS:

Folio	2°.
Quarto	4to.
Octavo	8vo.
Duodecimo	12mo.
Sextodecimo	16mo.
Octodecimo	18mo.
Vigesimo-quarto	24mo.
Trigesimo-secundo	32mo.

SOME SUGGESTIONS FOR BINDERS.—Please don't letter the titles in black when the binding is dark.

Please don't use letters so mysteriously fashioned that they cannot be read at sight.

Please don't fail to put the title on the back, even if it is chiefly displayed on the side.

Please don't line the covers with that kind of paper which always smuts the bookplate, nor with that which is permanently discoloured by a touch of paste.

Please don't make books that will not stand up without strong support on both sides.

Please don't put so much ornament on the back that one cannot read the lettering.

Please do leave some margin.

A Few Hints on the Care of Books.—Amongst others, the following suggestions to book-lovers appeared in "Notes and Queries" of an old date:

Never cut up a book with your finger, nor divide a printed sheet if it be ill-folded, as one page will rob the other of its margin.

Never bind a book wet from the press, as it cannot certainly be made solid without risking the transfer of ink from one page to another.

Never compress a book of plates in binding, as it injures the texture of the impressions.

Never destroy an antique binding if in moderate condition; if necessary repair it carefully. Do not put a new book in an antique jacket, or *vice versa*.

Never allow a book to be "finished" without the date at the tail of the back; it saves subsequent trouble, and the book from much needless handling.

Never have registers or strings in your books of reference, they are apt to tear the leaves; paper slips are the best, if not too numerous.

Do not allow your books to get damp, as they soon mildew.

Do not allow books to be very long in a too warm place. Gas affects them very much, russia in particular; morocco stands heat best.

Rough-edged books suffer most from dust. Gilt edges are the best; at least, gild the top edges.

Do not, in reading, turn down the corners of the leaves; do not wet your finger to turn a leaf, but pass the forefinger of the right hand down the page to turn over.

Do not allow foreign substances, crumbs, snuff, cards, botanical specimens, to intrude between the leaves.

Do not stand a book long on the fore-edge, or the beautiful level on the front may sink in.

Never wrench a book open if the back is stiff, or the edges will resemble steps of stairs for ever after; open gently a few pages at a time.

Never lift books by the boards, but entire.

Never pull a book from the shelf by the headband; do not toast them over the fire, or sit on them, for "Books are kind friends, we benefit by their advice, and they reveal no confidences."

MISCELLANEOUS

RULING TISSUE PAPER.—This is a method for ruling such papers as cannot be properly carried through and ruled upon ordinary ruling machines owing to its liability to crimp or gather under the pens. By this process it is intended so to rule the paper that the lines as they are drawn may strike through the substance of the paper so as to present both surfaces of the finished sheet alike, and to rule the paper in a continuous sheet as it is delivered from the paper-making machine. The paper is drawn under tension, over a roller, and from thence over a felt-coloured roller, which revolves in a trough containing a solution of saccharine matter and ox-gall, by which it is moistened, to put it in condition to receive the ink. From the roller it passes under a brush-roller, having its periphery armed with bristles and travelling in a direction opposite to the line of travel of the paper. This roller smooths out the wrinkles from the paper caused by moistening. The paper next passes to a drying-roller, and then below the ruling-pens, which are supplied with ink as in an ordinary paper-ruling machine. The paper thus moistened and prepared receives the ink-lines while in such condition that the same may strike through its body. The drying-roller is suitably heated to dry the ink deposited from the pens, and prevent it from spreading and blurring. From the drying-roller the paper passes between calendering rolls, one of which is heated, to dry and surface the paper. The paper is finally wound upon a drum, which serves to roll and store it, and also to keep it at the proper tension under the pens, so as to receive the lines properly, the travel of the web or blanket being so regulated to the rate of rotation of the drum that the sheet will always be taut when passing under the pens.

Good Ruling.—This must have the following qualities: The lines must cover each other on both sides—that is, the lines on both sides of the sheet must stand in exactly the same places and occupy the same intervals. Upon looking through a ruled sheet the lines on both pages must cover each other precisely. The ruling throughout the whole book must be of the same shade. So, too, must the ruling of each page be of even heaviness and of one shade. For ruling purposes aniline colours are used almost exclusively, for the reason that they give a very handsome pleasing colour, and are cheap, but many manufacturers make use of carmine ink. While it may be less brilliant in colour, it is much faster and suffers no harm from light or dampness.

On Paper Ruling.—There are several machines which enable a printer to rule a small quantity of paper without the delay and trouble of sending it to a regular paper ruler. In using these machines much difficulty is experienced sometimes in operating on some kinds of paper, not through any defect in the apparatus, but owing to a want of knowledge of the art itself. For instance, certain sorts of sized paper do not take the blue ink properly, that is, in ruling technicality, it does not "strike." The lines are composed, in fact, of a series of bead-like dots, instead of being solid and unbroken. The amateur ruler should know that paper requires a certain quantity of gall mixed with the ink. Ox-gall should be procured if possible. Having prepared the ink to the tint required, mix well with each quart one tablespoonful of gall. Increase the quantity of gall as the paper is hard or greasy, bearing in mind that the flannel over the pens must be kept perfectly clean by being washed every other day in a little warm water with soap. If the acid in the blue ink has not been properly destroyed all the gall used will not prevent the bead-like lines. Particular care must also be taken that all the pens have the same bearing; if not, the one which presses too heavily will give a thick line, whereas the one hardly touching the paper will show a dotted broken one. Assuming that each pen is of the same length, begin by regulating the bearing of them by means of the regulator attached to the carriage of the machine. This carriage is the part which grips the

slide wherein the pens are placed. Let the nibs of the pens be of the same angle, which must be secured by drawing them over the sand-paper several times. Do not work the pens too much on the slant, but tolerably upright. The parts carrying the carriage will regulate this. Paste blue is sold by the ink makers, and is used thus: Dip a brush into the paste and rub three or four times round the basin. If the ink has been standing all night, it will be necessary to turn it backwards and forwards in two basins.

Wise Counsel to Young Printers.—To the young man who is just commencing the printing business, or the older man who is not following it successfully, there is a grand study in the biographies of the old printers. Even a careless reader cannot fail to observe that all commenced without means, and that in every case there was determination to do only the best work. The success achieved is most marvellous and is surpassed in few other lines of business. Who, then, shall say that the printing business is not lucrative if properly conducted? What possible evidence can be more emphatic than the records of these most successful men? The secret of success is no longer a secret.

Crystallotypy.—This is a process for producing artificial tint plates. This name is given because the production depends upon a crystallizing of certain salts, poured in a dissolved condition upon a level glass plate. By it are secured designs like frost work seen in winter upon the window-panes, and if impressions are made to transfer paper with a printer's roller such designs may be transferred to stone. The following recipe is given: Take either 200 parts of water and 20 parts of sulphate of copper, or same proportions of either water and red prussiate of potassa, or of water and alum, or, finally, of water and bichromate of potassa, cover with the solution a level and well-cleaned glass plate, and a few hours are sufficient to cause the water to evaporate and the design to appear.

Facsimiles of Writing.—Printing facsimile copies of a letter or other written document without having recourse to litho. transfer ink, which to an ordinary man offers so

many difficulties, can be successfully carried out. Lay a sheet of carbon paper over a sheet of transfer paper, and write with a hard pencil on the back of the carbon papers. A copy of the writing will be found on the transfer paper, which may be at once transferred to an aluminium plate and printed from as usual. This writing would not, of course, have the thick and thin pen-strokes of an ordinary letter, but would commend itself for its simplicity and ease to most business men.

Making Slate Pencils.—The stone is first sawed into blocks; these are split quite easily with a chisel into slabs a little thicker than the finished pencils, and are passed through a planing machine and over an emery belt to make them flat, smooth, and of a uniform thickness of about three-sixteenths of an inch. Next they are run into the jaws of a pair of steel plates, in the under one of which are six rows of curved knives, each set so as to cut a little deeper than the one that went before it. These plough out parallel grooves half way through the slab, a second "crocodile" lying in wait alongside cutting the grooves on the other side. Lastly, they are broken and pointed upon an emery belt. A man can give this last touch to about 8,000 in a day.

Steel-Die Stamping.—This is sometimes mistaken for embossing by the uninitiated. As embossed stationery is intended to be a cheap substitute for expensive steel-die work, we must first understand the process of steel-die stamping and then aim to imitate it—striving primarily to produce the lustre which distinguishes the steel-die work. The plate for this work is engraved on soft steel, which has subsequently been hardened for the work. In appearance it is identical with the embossing die on metal. The colours used, or prepared by the printer from dry colours, are mixed with damar varnish and turpentine—the turpentine acting as a quick drier, the varnish imparting the lustre. This ink is applied to the plate with a feather or camel-hair brush, the cavities well filled, and the face of the plate wiped clean on tissue paper. This wiping of the plate, face down, on tissue paper, removes all surplus ink

from the surface, while it leaves the ink deposited in the cut-out lettering on the plate. This plate is then placed in the stamping-press, the sheet laid on or under, and great pressure brought to bear on it. The sheet thus pressed on the plate takes up the ink in the cavities of the lettering in cakes, as it were, which quickly dries. The sheet is not forced into the die, as in embossing, and therefore steel-die stamping cannot be classed with embossing.

The First Dated Book.—The first book printed with a date, and the first example of printing in colours, is a Latin psalter, on vellum, printed by Fust and Schoeffer, at Mentz, in 1457. The initial letter commencing each paragraph is printed in red. It is supposed to have been the first psalter printed. The British Museum contains a copy of this ancient publication.

Removal of Gum Water Stains.—The greasy-looking stain or blot left by gum water when used on paper from which the size has been removed, or which otherwise has become more than usually permeable, may be removed by the addition of sulphate of alumina to the mucilage. One formula runs: 2 grams of crystallized sulphate of alumina dissolved in 20 of water are added to 250 grams of gum arabic (2 to 5 strength). Another formula gives twice as much sulphate as above; in another the gum mucilage is directed to be made of greater strength, and the alumina salt to be added in the proportion of one thirty-third part of the weight of the gum employed.

Hints to Draughtsmen.—The mixing of inks is much expedited by first heating the dish and water in which the ingredients are mixed. It often happens in the summer that flies walk over a tracing and eat off the ink in a provoking manner, but the use of vinegar instead of water will prevent this. In making a tracing the cloth will take the ink much better if it is rubbed over with chalk. Tracing cloth which has been rolled up may be straightened out effectually and expeditiously by drawing it over the edge of a table or drawing-board, holding it down meantime with an ordinary three-cornered scale. When a large num-

ber of drawings are made and kept, much trouble and confusion can be avoided by making all the drawings on extra standard sizes. If a size of 16 × 24 in. be adopted, then the next larger size would be equal to two of these, or 24 × 32 in. This enlarging or reducing process may be carried as far as circumstances require, but it is best to do it by the doubling or halving process if possible. One of the advantages of standard sizes of drawings is that they may be kept in drawers, the size of which is made to accommodate the standard sizes determined upon.

Rusting of Screws.—Printers and others will be glad to know how to prevent screws from becoming fixed through rust. It is well known that iron screws are very liable to rust, especially when they are placed in damp situations. When employed to join parts of machinery they often become so tightly fixed that they can only be withdrawn with considerable trouble—a fracture sometimes resulting. To avoid this inconvenience screws are generally oiled before being put in their places, but this is found to be insufficient. A mixture of oil and graphite will effectually prevent screws becoming fixed, and will protect them for years against rust. The mixture facilitates tightening up, is an excellent lubricant, and reduces the friction of the screw in its socket.

The Proof Reader's Works of Reference.—The proof reader for certain classes of work must be a specialist in literature, and even in languages, but for the general run of everyday work the following list will be found to cover most requirements for reference purposes: A first-class English dictionary; a reliable gazetteer; a Bible; French-English, German-English, and Latin dictionaries are very useful; a dictionary of foreign quotations (a good English dictionary may be obtained which includes a list of these); and one or more of the standard text-books of the trade. This equipment for the reader may be materially increased with advantage. For instance, a post-office directory and railway time-table may be found of great use at some time or other in ascertaining names of places; a local directory is invaluable; Whitaker's Almanacks or

Hazell's Annuals may prove of service; and, in short, the list may be greatly extended. The reader, however, knows best the kind of reference he requires and can make his own selection, beginning with the indispensables, for a comparatively small sum.

Graph Process with Printers' Ink.—Make the ordinary pad with glue and glycerine, only using a larger proportion of gelatine. For ink take a concentrated solution of alum covered with any aniline dye to render the marks visible, and execute the drawing or writing on good stiff paper. Wipe the pad with a damp sponge, and allow the moisture to remain a few minutes to make the surface sufficiently absorbent. Now place the paper, face down, on the pad. After a few minutes remove the paper, and the writing or drawing is transferred to the pad ready for printing. This is done by applying printing ink to the surface by means of an india-rubber roller, the ink adhering only to the lines made by the alum solution. To take the impression, place upon the pad a sheet of paper, slightly damped, and gently rub it with the fingers. Remove the paper, which is now printed, ink the pad again, and keep on in the same way as long as the impression is sharp enough. A large number of copies may thus be taken, of a good black, and as permanent as ordinary printing.

Cheap Jacketing for Steam Pipes.—A recipe is as follows: Wrap the pipe in asbestos paper, and lay a number of strips of wood lengthwise, from six to twelve, according to the size of the pipe, and bind them into position with the wire; around the framework thus constructed wrap roofing paper, fastening it with paste or twine. If exposed to the weather, use tar paper or paint the outside.

White Paper moistened with benzine becomes temporarily transparent, and can be used in transferring any design by tracing, obviating the necessity of using tracing paper. The benzine will afterwards evaporate, and leave the white paper opaque as before.

Gloss Varnishing.—If a gloss will not stay on paper, and the varnish has given good results before, it must be the fault of the paper; although there are so many kinds of gloss varnishes, and so many methods of varnishing, the following will be of interest. It is evident that those who have not a varnishing machine would prefer to print a gloss upon the printed sheets. As a general rule a printed gloss can never be as good as a coated one, but a recipe for the best gloss obtainable by printing will be useful; but before giving this, it will be well to make it clear why some varnishes are better than others, and why some papers lose the gloss after varnishing and printing: (1) the varnish can only stay on a printed sheet if the sheet does not absorb the varnish; (2) the paper absorbs the varnish when the sizing does not contain glue enough. A regular writing or sized book paper is not always fit to print work on which has to be varnished afterwards; the paper may be tested before printing with the varnish to be used; paper of any fibre, if sized enough, will keep the gloss on its surface, and so with enamelled papers. The coating of the paper is the cause if the printed sheets keep the gloss or if the gloss soaks into the paper. Every enamelled paper which lifts the ink nicely in printing is the worse for varnishing. What is wanted is a paper into which the varnish does not soak. If we have not the paper as desired, a remedy must be found, and this is easily done. Take for instance photographic views. Have the lightest tint printed all over the picture, and print this tint with as little thin varnish in it as possible; add silicate basic potassa until the tint becomes of the consistency of body colour, without using heavy white and magnesia. This tint will give the paper a sizing, and enable it to keep the gloss. The more colours are printed on the top of each other the better the gloss will be. The best gloss varnish for printing is forty parts of varnish No. 3, forty parts of damar varnish, fifteen parts of yellow beeswax, and about five parts of silicate basic potassa. Melt the wax first over a fire, then add the varnish (always stirring), and when everything is well mixed, let it become cold, and do not add the water gloss until the varnish is to be used in printing. The gloss varnish, instead of being done by an

extra printing, can also be mixed with any tint and printed at the same time; it will remain on the paper, and will neither break nor crack.

Keeping the Hands Soft.—Many printers whose hands have become rough and tough will be glad of hints how to keep them in good condition. A little ammonia or borax in the water used to wash the hands with, and that water just lukewarm, will keep the skin clean and soft. A little oatmeal mixed with the water will whiten the hands. Many people use glycerine on their hands when they go to bed, and wear gloves, but glycerine makes some skins harsh and red. These people should rub their hands with dry oatmeal and wear gloves in bed. The best preparation for the hands is white of egg, with a grain of alum dissolved in it. The roughest and hardest hands can be made soft and white in a month's time by doctoring them a little at bedtime; all the tools needed are a nailbrush, a bottle of ammonia, a box of powdered borax, and a little fine white sand to rub the stains off, or a cut of lemon, which will do even better, for the acid of the lemon will clean anything. There is no reason why one should have hard and rough hands if with a little care they can be made soft and smooth.

Gold Leaf Printing on Silk.—Take a fine brush of camel's hair and coat the silk or satin ribbon with a thin layer of silicate of potassa (water gloss). Let it dry and then print in the usual way with gold ink. Grind burnt sienna as thickly as possible with No. 3 varnish and add the following reducers: 10 parts of yellow wax, 10 parts of Venetian turpentine, 25 parts of No. 2 varnish, and 5 parts of burnt linseed oil. Use this mixture when perfectly blended and melted together as a regular reducer to the sienna ink; print as usual, taking care that too much ink never gets upon the roller, and when the impression is made put on the gold leaf, Dutch metal, silver leaf, etc. Place a sheet of the finest glazed paper (such as the gold bronze is usually packed in) with the glossy side toward the gold and pull once again through the press, by which another new impression can be made as usual in

gold leaf printing on paper. Let the impressions remain over for a day, then rub off the superfluous gold with soft, clean cotton dipped in soapstone, and the impression will appear clean, sharp, and solid.

PLUS, MINUS, AND EQUAL MARKS.—The signs + and −, it is said, were first used by Christopher Rudolf about 1524. The sign = was first employed by Robert Recorde in 1557, because, said he, "noe 2 thynges can be more equalle."

CELLULOID.—This is also called by various other names, and is a preparation of cellulose from wood, cotton waste, paper, or other similar substances. Woody fibre is prepared for this purpose also in a similar way to that used for producing paper pulp. The fibre is steeped in a mixture of nitric acid and rectified sulphuric acid, 1 part of the former acid, of 1·42 specific gravity, to 4 parts of the latter acid. It will thus be seen that it is similar to gun-cotton. After it has been properly treated with this mixture, it is drained and pressed by hydraulic pressure to remove excess of acid. The woody or other fibre is treated, either pulped or not, with a solution of nitrate of zinc, chloride of zinc, or other similar compound. It is said that the nitrate of zinc quickly dissolves the fibre. At a proper temperature more fibre is added to the solution until a proper consistency is obtained. The operation is performed by properly constructed machinery, and the excess of zinc nitrate is removed by washing in water, alcohol, or other suitable vehicle. The articles are formed whilst it is in the soluble state, and the solvent is in it, the solvent being removed by subsequent washing. Celluloid has been used for making blocks for printing from, and slips of it pasted on wooden mounts make excellent surfaces for printing ground tints from. To render it non-combustible, phosphates of lime, zinc, or alumina, oxalates of lime, magnesia, or zinc, baryta, soda, strontia, etc., are added in quantities amounting to from 10 per cent. to 150 per cent. When coloured with dyes or pigments, it is used for making small-tooth combs, billiard balls, knife handles, and many other purposes. One of the most novel is the use of it in making

fronts, cuffs, and collars—when they become dirty all that is required to clean them is a little soap and water.

The Ampersand.—This character, "short and" (& or &) as it is known among printers, has the above title in the dictionaries, where it is said to be "a corruption of *and*, per se *and*, i.e. *and*, by itself *and*." It was originally formed—as may be seen in some old-style italic founts of to-day—of a combination of the capitals E and T, making the Latin and French word "et," signifying "and." Its only use is in connecting firm and corporation names, in &c., and it is sometimes permitted in display lines where the whole word cannot be inserted. Its use in any other case is obviously improper. Yet Smith, in his "Printers' Grammar," mourned that the contraction & was obliged to yield and to suffer "its comely form" to be supplied by the single letters e and t. In a French history of printing, published in 1740, the character & is used for *et* in every instance except where beginning a sentence. In giving tha order of the lower-case sorts, Smith places the & between e and f.

The Use of the Half-Title.—The use of this fly-title, sometimes called a bastard title, is for the purpose of protecting the general or full title from injury. Without this additional leaf in front, the title-page, being the first in the book, would be very likely to get soiled.

Demands of Public Libraries.—By Act of Parliament five copies of each work, and of each subsequent edition, must be dispatched to the libraries of the British Museum, London; Bodleian, Oxford; University College, Cambridge; Trinity College, Dublin; and Advocates', Edinburgh. The first one is sent to the copyright department of the British Museum, and the other four are generally sent through the official agent in London, who gives a receipt for them. If by chance these copies for the libraries are delayed or overlooked, a demand is soon made for them, and must be complied with. Privately subscribed books of a limited number, not sold in the ordinary way, or advertised, are exempt from these demands.

Registration at Stationers' Hall.—This is not a compulsory matter, but should any one desire to bring an action for infringement of title or copyright it must then be registered (if this has not already been done), the date of publication being the criterion of priority. A five-shilling fee is charged by the Stationers' Company when the application is made and the title of the volume duly entered. Very frequently the fact of registration is expressed at the bottom of the title-page, but this is really not necessary if the date be there.

How Gelatining is Done.—The principal arrangement required for gelatine varnishing comprises several plates of heavy glass fixed in wooden frames and marked each with a distinctive number. Shelves should be built up against the wall, covered with a layer of pasteboard, and perfectly level, so that the glass plates may rest in a level position. The gelatine is broken into fragments, tied up in a clean sheet of linen, and placed in cold water until sufficiently soaked. It is then placed in a pot of water over an alcohol lamp, the boiling water dissolving the gelatine and all impurities being kept back in the cloth. The result is a readily flowing solution, to which an equal volume of alcohol is to be added, as without such an addition the mass would soon harden and set unevenly. The more convenient proportions are two parts of gelatine and five parts of water, to which add three parts of alcohol. Keep the vessel covered to prevent the alcohol from volatilizing. Use a tin vessel, with graduated scale, so as to get uniform quantities of the fluid. Before being covered with the gelatine the glass plate should be oiled slightly to prevent the mass from adhering. From the cup with the graduated scale pour the gelatine in a lukewarm condition, about the consistency of molasses, upon the glass plate. Move the glass plate to and fro until it is covered in all its parts, then return it to its place upon the shelf. In about fifteen minutes the picture to be covered should be moistened uniformly upon the reverse, and then placed upon the gelatine mass, which by this time is somewhat solid. Here the picture is allowed to remain for two or three days, when with a dull knife the mass may be ripped round the

margin and the picture pulled off with its gloss coating. A varnishing with collodion has the effect of making the gelatine coating waterproof and more flexible without detracting from the transparency.

THE PRINTERS' WAYZ-GOOSE.—The origin of this word is not generally known. On the authority of Bailey the signification of the term is a "stubble-goose." Moxon, writing in 1683, gives an early example of its use in connection with the annual dinners of the printers of that time. He says: "It is also customary for all the Journeymen to make every Year new Paper Windows, whether the old ones will serve again or no; Because, that day, they make them the Master Printer give them a *Way-goose*; that is, he makes them a good Feast, and not only entertains them at his own House, but, besides, gives them money to spend at the Alehouse or Tavern at Night; and to this Feast they invite the *Corrector*, *Founder*, *Smith*, *Joyner*, and *Inkmaker*, who all of them severally (except the *Corrector* in his own Civility) open their Purse-strings and add their Benevolence (which Workmen account their duty, because they generally chuse these Workmen) to the Master Printer: But from the *Corrector* they expect nothing, because, the Master Printer chusing him, the Workmen can do him no kindness. These Way-goose are always kept about Bartholomew-tide. And till the Master Printer hath given this *Way-goose* the journeymen do not chuse to work by Candle-Light." Other authors have quoted Moxon on the above, adding riders of their own composition, more fully explaining the meaning of the term. Thus Timperley, writing in 1839, in a footnote, says: "The derivation of this term is not generally known. It is from an old English word *Wayz*, stubble. A stubble-goose is a known dainty in our days. A wayz-goose was the head dish at the annual feasts of the forefathers of our fraternity."

ELECTRIC PRINTING.—The outlines of the invention for electric printing are as follows: The cotton, linen, or paper is first saturated with a solution of aniline black in water. The wet paper or fabric is then placed on a disk of metal, under which is a non-conductor, such as glass or caout-

chouc. Another disk, on which is the drawing, is placed on top of the paper. The current is then connected with the two metal disks, and with a little pressure a photograph in black is produced. There are other modes of working, such as writing with iron or steel pencils, which will act as electrodes. The solution of aniline shows up the lines better, and does not blot if tragacanth, gelatine, or starch be added.

Copyright.—The term of copyright in any book published in the lifetime of the author shall endure for the natural life of such author, and for the further term of seven years, commencing at the time of his death; provided that, if the said term of seven years shall expire before the end of forty-two years from the first publication of the book, the copyright shall endure for forty-two years. The copyright in any book published after the death of its author shall endure for the term of forty-two years from the first publication thereof, and shall be the property of the proprietor of the author's manuscript unless otherwise assigned or bequeathed.

The "Printers' Devil."—This trade term originated in Italy. Aldus Manutius was a printer in Venice. He owned a negro boy, who helped him in his office; and some of his customers were superstitious enough to believe that the boy was an emissary of Satan. He was known all over the city as "the little black devil," from his dirty appearance, as his face and hands were generally well smudged with printing ink. Desiring to satisfy the curiosity of his patrons, Manutius one day exhibited the boy in the streets, and proclaimed as follows: "I, Aldus Manutius, Printer to the Holy Church and the Doge, have this day made public exposure of the Printers' Devil. All who think he is not flesh and blood may come and prick him!"

Ancient Use of Vermilion.—Native cinnabar, or vermilion, a sulphuret of mercury, was, it is said, first prepared by Kallias, the Athenian, five hundred years before Christ. There was a minium or cinnabar wrought in Spain

from stone mixed with silver sand; also in Colchis, where they disengaged it from the fronts of the high cliffs by shooting arrows at them. Pliny and Vitruvius call it minium, and Dioscorides observes that it was falsely thought by some to be the same as minium. Vermilion is the colour with which the statues of the gods were painted. It was abundant in Caramania, also in Ethiopia, and was held in honour among the Romans. Their heroes rode in triumph with their bodies painted with vermilion, and the faces of the statues of Jupiter were coloured with this pigment on festal days. The monochrome pictures of the ancients were wrought with it. There was also an artificial kind of cinnabar, a shining scarlet sand, from above Ephesus. Vitruvius and Pliny say that vermilion was injured by the light of the sun and moon. To prevent this result the colour was varnished by a mixture of wax and oil. Sir Humphry Davy found vermilion in the Baths of Titus.

Coats of Arms.—Many persons will remember that the Government have prohibited the use of the Royal Arms by persons not having written authority to display them. The same rule applies to the arms of counties and boroughs. Except by Royal licence no person has the right to assume any heraldic device, unless by sanction of Heralds' College and the payment of a yearly duty; and no tradesman has any more right to use the coat of arms of the borough or county in which he resides, on anything he issues in the way of trade, than he has to print thereon the arms of the lord lieutenant of the county, which, of course, he would never think of doing. As this rule is frequently infringed, this information is given as a caution, else some persons may find themselves possessed of a large quantity of printed matter, against the issue of which they run the risk of receiving an injunction in Chancery, or some other equally disagreeable process at law.

The First Printed Book was printed in 1455 from movable types, and is called the 42-line or "Mazarin" Bible. It was executed at Mentz, and is generally attributed to Gutenberg, though of recent years thought to be due to Peter Schoeffer.

"SCRATCH-COMMA" is an old name for the sign / commonly used between shillings and pence, between fractions, and between c and o as an abbreviation for "care of." In bibliographical works it is used to mark the ends of lines in title-pages, etc.

COLOURS OF GOVERNMENT "BLUE BOOKS."

The	English	official	colour is	Blue.
,,	French	,,	,,	Yellow.
,,	German	,,	,,	White.
,,	Austrian	,,	,,	Red.
,,	Italian	,,	,,	Green.

SWEEP IN THE EVENING.—No one has ever waged a more unrelenting battle against dust and dirt than does the printer who has due regard for the life of his material and the appearance of his work. The general practice, however, of deputing the office "devil" to sweep out before the arrival of the rest of the force is not the best. Even the most careful sweeping or brushing is bound to raise a little dust which occupants of the office are compelled to breathe during the time it permeates the air, and as the dust stirred up by the morning cleaning settles, it finds uncovered cases, freshly oiled and washed presses for its reception. If a printer value the health and comfort of his work people or the cleanliness of his machinery and material, he will have the daily cleaning done at the end of the day's work instead of at the beginning.

GAS ENGINES.—In the silent form of gas engine, the gas, instead of entering the cylinder at its normal pressure, is pumped in by a stroke of the piston, which compresses the extremely dilute explosive mixture of gas and air, to about 30 lb. on the square inch. In starting the engine, the first revolution of the fly-wheel—pulled round by hand—pumps in the mixture, which is fired in the succeeding revolution, so that the engine goes on alternately pumping and exploding, though not necessarily at every other stroke, for when once set going, if it is doing no work, it only fires at every seventh or eighth stroke, but as soon

as the belt is put on an extra machine set in motion by it, the governors fall, and allow the explosions to take place oftener, up to every other stroke.

To Soften Sealing-Wax Blots.—These may be softened by means of alcohol and then scraped away with ossa sepia. Sealing-wax of all colours easily dissolves in strong alcohol, and forms a most excellent varnish for small ornaments.

Autotype Plates.—The method employed is as follows: A plate, preferably of glass, is carefully coated with a solution of gelatine containing bichromate of potash. It is then dried, and an ordinary photographic negative is placed in contact with it and exposed to the action of light, which hardens all the parts corresponding with the transparent parts of the negative or the dark parts of the picture. After the proper exposure the plate is washed in cold water to remove all the sensitizing material, and it is then dried. The gelatine surface will be found to have changed, so that it will act precisely like a lithographic stone; when moistened the parts which were protected from light by the opaque parts of the negative absorb water, while the other parts remain dry. A roller charged with fatty ink is rolled over the plate, the ink adhering to the dry parts and being rejected by the parts which have absorbed water. Paper is now placed on the inked surface and subjected to pressure, when the design will be transferred to the paper. Then the moistening, inking, and pressure are repeated until the required number of copies has been produced.

Preventing Gummed Stamps, etc., Sticking.—To keep postage stamps and other gummed articles from sticking together, rub them over the head; the natural oil on the hair oils them.

A Copying Process.—A chemist has invented a process by which a paper impervious to water is painted with the following solution: Gelatine, 1 part; glycerine, 5 parts; Chinese gelatine, 0·2 part; water, 1 part. The manuscript

is written with the following solution: Water, 100 parts; chrome alum, 10 parts; sulphuric acid, 5 parts; gum arabic, 10 parts. The manuscript is laid on the first paper, and the latter is thereby rendered incapable of taking up an aniline colour solution with which the surface is then flowed. Excess of colour is absorbed with silk paper, and negative impressions taken on clean paper.

Transparent Coating for Prints.—It may be worth noting that a transparent coating, combined with a permanent glossy appearance, may be imparted to prints by mounting them on wet cardboard and applying a decoction composed of 3 oz. of white glue, 8 oz. of soft water, half the white of an egg, 10 drops of glycerine, and 3 grains of French chalk heated until thoroughly dissolved. It is not implied that a valuable print is improved by this or any other similar process, but the recipe may be useful in many cases where pecuniary value is not a very important factor.

Relief and Plain Stamping.—The following directions for plain stamping will be found useful: Fasten the die in die-dish with gutta percha if it has no shank, if it has a shank the screw in die-dish will hold the die firmly; cut two or three pieces of gummed cardboard, take one piece and damp the gum, placing it on the die with the gummed side upwards, then bring down the lever with a smart blow (the "dab" or piece of jagged steel being at the top, to which the gummed card will then adhere), then take the other pieces and treat in a similar manner. After striking them two or three times, take the dab from the press, with the card counterpart adhering, then take a small piece of gutta percha and heat it, but not so as to burn, and place it on the cardboard, spreading it with the finger over the work—first damping the finger to prevent the gutta percha sticking to it; replace the dab in press and place a thin piece of paper on the die and bring the lever down with a moderate pressure—a counterpart will be the result—then take a penknife and cut away the superfluous gutta percha close to the work. The guide board being fixed, insert pins therein to suit the position

required of impression on paper or envelope, and bring down lever to give the blow. For relief stamping the instructions are different: When the counterpart is made, mix the colour to the substance of thin gum; then take the die out of press and brush the colour well into it—exchange into right hand, face downwards, and wipe off the colour on the printing paper on to the bench. Let this be done systematically, so that paper is not wasted. The colour is taken off the surface, but left in the engraved work. Place the die again in the press, insert paper, bring down the lever with a sharp blow, and the result will be a perfect impression. If the colour on slab and brush should get dry, a few drops of turps will moisten it. To keep brushes moist wrap them in paper after using, to keep the air from them. To make the impression glisten or shine, mix the colour a day or two before using, and use no turps. Never let the colour remain on slab, as it will dry up. Keep in small gallipots covered, after being mixed up on slab.

Chromograph Bed for Copying Purposes.—Take white gelatine, 1 lb.; glycerine, 1 lb.; glucose, 1 lb; strong white glue, 1 lb.; water, 5 lb. The glue should be placed in water for a short time, then laid out to soak a little and allow the surplus water to run off. When this has been done, melt all in a vessel partly submerged in another vessel containing boiling water, taking care that the ingredients do not get burned while cooking. As soon as all are thoroughly melted, pour gently through a fine sieve or a piece of coarse linen into a shallow tray the size desired. When properly cooled and allowed to season a day or so, it is ready for use. To make a writing copying-fluid for the "chromograph" process, take 2 parts of aniline violet to 30 parts of alcohol. Add water to same as may be needed.

To Keep Unmounted Photos Flat.—A formula to prevent the curling up of unmounted photographic prints is as follows: After the final washing, plunge the prints in a solution made of water, one part, alcohol, four parts, and glycerine, three parts.

To Copy Printed Matter.—To do this on any absorbent paper, damp the surface with a weak solution of acetate of iron, and press in an ordinary copying press. Old writing may also be copied on unsized paper, by wetting with a weak solution of sulphate of iron mixed with a small solution of sugar syrup.

Printing on Wood.—There is a French invention for printing on wood by means of hot type. A guide regulates the degree of heat. The inventor claims that the impression is as neat as if obtained by lithography. By using a special ink cold type may be employed. Only one man is required to work the machine, which will print 350 boxes or 400 flat pieces of wood an hour.

Healthiness of the Printers' Work.—Owing to the dust arising from type metal, and the tendency of compositors to lean over the case while at work, it has been frequently asserted that the printing business is not conducive to long life. This is a mistake. There is scarcely any indoor occupation, when care as to eating and drinking is observed, which is healthier than that of printing.

Photographic Printing in Colours.—In this process it is necessary to use coloured negatives—that is, ordinary negatives which have been hand-painted in the required tints with transparent colours. (1) Take a piece of ordinary sensitized paper, and wash it to remove any free silver nitrate. (2) Place the washed paper in a solution of protochloride of tin, and expose to weak light until the silver chloride is reduced to subchloride, and the paper assumes a uniform gray colour. (3) Float the paper in a mixed solution of chromate of potash and sulphate of copper, and dry in the dark. The paper is now sensitive to all the colours of the spectrum, and by printing on it with a coloured negative the colours of the negative will be reproduced. After printing, wash with cold water, and dry.

How to Trace Photographs.—Lay a sheet of gelatine over the photograph, and then with a sharp steel point scratch the outlines required, which will show light on a

dark ground. Remove the gelatine and finely scrape some red chalk over it. Rub this powder into the scratches, and dust off the superfluous chalk with a brush. This tracing may then be laid down upon the stone and pulled through the press, when a good red chalk tracing will be obtained. It can also be laid upon the stone and rubbed down with the end of a pencil cut flat or other convenient tool being passed over it with some pressure. If wanted non-reversed upon paper, it is first passed through the press upon paper, to get a reverse, which in turn may be used to obtain the non-reversed one, for painting upon or other like use. If gelatine cannot be obtained, the photograph can be freed from grease by cleaning with india-rubber. The outlines may then be drawn with an ink composed of Indian ink, to which is added a small quantity of ox-gall, sugar, and gum. A piece of damp paper is then laid upon it, and the whole passed through the press. As the result is a reverse, tracing paper need not be used, because it is in the proper position for tracing to stone. Should a non-reversed tracing be required, use tracing paper for obtaining the set-off. A photograph thus treated will scarcely be soiled if the remainder of the Indian ink be washed off.

Restoring Faded Photographs.—It has been discovered that faded photographs can be restored to their original colour by immersion in a dilute solution of bichloride of mercury till the yellowness disappears. If the photo is mounted the operation can be performed by placing it in close contact for a sufficient time with blotting paper well saturated with the bichloride. The process does not restore lost detail, but simply removes the sickly yellow colour and makes the pictures bright and clear, possessing after the operation a much warmer tone than they did originally.

The Care of Wood-Blocks and Electros.—Nothing ruins blocks like grit. Do not keep blocks in trays, but have them placed upright on shelves, and numbered according to the proofs in the specimen book. By this means any block wanted can be obtained at a moment's notice, and much valuable time saved. When the block

has been worked off, see that it is properly washed over with good turps, and not left for the ink to dry and fill up the fine lines. Wood-blocks should be kept in a dry room which does not get over-heated. If the room is kept at too high a temperature, the blocks are likely to warp and crack. Many valuable wood-blocks have been spoilt in this way. The same applies to the keeping of electros. If not properly looked after, the wood on which the electro is mounted will warp, the nails become loose, and the electro will come off the wood at the most unexpected and perhaps inopportune moment. There is nothing like order and cleanliness in the keeping of blocks, whether they be valuable wood engravings or only electrotypes used for jobbing purposes.

ENGRAVINGS may be transferred to white paper as follows: Place the engraving for a few seconds over the vapour of iodine. Dip a slip of white paper in a weak solution of starch, and, when dry, in a weak solution of oil of vitriol. When again dry, lay a slip upon the engraving, and place both for a few minutes under a press. The engraving will be reproduced in all its delicacy and finish. Lithographs and printed matter cannot be so transferred with equal success.

THE KEEPING OF WOODCUTS AND ELECTROS.—This is a source of no little trouble to a printer. Many of them do not belong to him, but are sent in by customers, who often, months after they have been used, direct them to be given up at once to some third party. Long after this, and forgetful of the fact, they send again and ask for them to be given up to themselves, and unless the printer has a record of his dealings with them, much time and temper are likely to be lost in a fruitless search. The best way of recording blocks is to have a folioed guard-book with an index to it. Whenever a block comes in let a pull of it be taken, and stuck into the guard-book; under it should be written these facts: (1) Number of block; (2) short description of block; (3) if original woodcut or electro; (4) name of owner; (5) from whom received; (6) whenever the block is placed in the store closet, the number of the press

and shelf should be entered in the book, and a number corresponding with the folio of that book stuck on the block itself. The book is indexed according to the name of the customer whose the blocks are. Therefore, when a block is sent for, the pull of it in the block-book can be readily turned up, and the position of the electro in the closet ascertained. On its being given up, a receipt should be taken for it, in a book to be kept for the purpose, and the date of delivery, and name of the firm to whom it is given up, entered in the block-book under the former entries concerning it.

WHAT ARE REMARQUE PROOFS?—Booksellers and binders are sometimes asked this question. In the present day a remarque proof means a really good impression from the plate with a finely etched sketch on the margin. In most cases a portrait of the artist is given. In earlier days a remarque on a plate was evidence of the artist's caprice. When Raphael Morghen engraved the "Last Supper," after Leonardo da Vinci, he caused some copies to be printed before the plate was finished; a salt-cellar was left incomplete. Proofs in this state are extremely rare and fetch high prices.

REPRODUCING OLD PRINTS.—Moisten the print to be reproduced with a solution of soda and soap until the ink has been softened. Place the sheet on a smooth slab, cover it with a sheet of white paper previously saturated in soapy water, and rub it with a muller until an impression of the print has been struck off. Five or six copies may be taken in this manner, which will be sufficient in most cases. Another method consists in applying a thin layer of paste, with which the original is covered, after which an ordinary roller is passed over it backward and forward. The ink adheres only to the black portions. The layer of paste is then carefully removed with a sponge, the original sheet is placed on a lithographic stone, the whole submitted several times to pressure, and the sheet finally wetted, when it may be taken off. The same plan is then adopted as in printing from a lithographic stone. In a third method acids and gum are applied. The sheet is wetted

with diluted acid to remove the sizing, enable the liquid to enter the pulp of the paper, and prevent the paper from absorbing the colour. A roller is then passed over the sheet, as in the second method. To prevent the new colour from combining with the acid, a thin layer of gum arabic is applied to the original. The latter may then be transferred to a stone.

SOFTENING RUBBER RINGS.—Rubber rings which have become hard and useless can, it is said, have their elasticity restored by being placed for half an hour in a solution of water and ammonia—about twice as much of the latter as of the former.

MAKING RUBBER STAMPS.—Obtain a vulcanizing apparatus with a thermometer and a lamp under it, such as dentists use, and an iron printing frame in which to lock up the type for all the names desired to reproduce in rubber, and of such a size that the plaster mould made from it can be placed inside the vulcanizer. This mould is made like an ordinary stereotype mould, by first oiling the type and then pouring the plaster over it; when set, take it off carefully, and do not let it dry, but proceed at once by placing on top of the mould a piece of sheet-rubber, not pure rubber, but vulcanized, and mingled with sulphur and soapstone. Then have two iron plates, one for placing on top of the sheet-rubber and one below the plaster mould, and which by proper screws can press together and squeeze the rubber on the mould. Back up the rubber with a few sheets of paper, to prevent it from sticking at the back of the iron plate. After screwing down sufficiently, immerse the mould and rubber in the water in the vulcanizer, screw the cap on, and heat to 300 deg. Fahr., then let it cool, open the vulcanizer, take out the mould and rubber, and remove the rubber carefully. This will be easily done if one puts the mould, while still wet, in the vulcanizer. Cut up the rubber so as to separate the various names, glue them to handles, and the hand-stamps are ready. This is the regular method, and if not satisfied with the impression given it is the fault of the manipulation. Such stamps give as clear an impression as can be

desired—as clear as metal type. But in printing with them apply a slight pressure only; the best rubber type can be made to give bad impressions by defective inking and rough manipulation in printing.

Impervious Rubber Packing.—This may be made steam- and air-tight by brushing it over with a solution of powdered resin in ten times its weight of strong water of ammonia. At first this solution is a viscid, sticky mass, which, however, after three or four weeks becomes thinner and fit for use. The liquid sticks easily to rubber as well as to wood and metal. It hardens as soon as the ammonia evaporates, and becomes perfectly impervious to liquids.

Removal of Grease and other Spots from Engravings and Books.—Grease spots, if old, may be removed by applying a solution of varying strength of caustic potash upon the back of the leaf. The printing, which looks somewhat faded after the removal of the spot, may be freshened up by the application of a mixture of 1 part of muriatic acid and 25 parts of water. In the case of fresh grease spots, carbonate of potassa (1 part to 30 parts of water), chloroform, ether, or benzine, renders good service. Wax disappears if, after saturating with benzine or turpentine, it is covered with folded blotting paper, and a hot flat-iron put upon it. Paraffin is removed by boiling water or hot spirits. Ink spots or rust yield to oxalic acid in combination with hot water; chloride of gold or silver spots, to a weak solution of corrosive sublimate or cyanide of potassium. Sealing-wax is dissolved by hot spirits, and then rubbed off with ossa sepia. Indian ink is slightly brushed over with oil, and after twelve hours saponified with salmiac; any particles of colour still remaining must be removed with rubber. Blood stains disappear after the application for twenty minutes of chloride of lime; the yellowish stain still remaining yields to a weak acid. Fresh spots of paste are removed with a moist sponge, older ones with hot water. Fusty stains of yellowish colour surrounded with a darker line disappear if the paper is bathed in clean water to which some chloride of

lime has been added. If they are found in bound books, linen damped in the same liquid is placed on both sides of the discoloured leaves, whilst the latter are separated from the other leaves by tin-foil. As soon as the spots have disappeared, the linen and tin-foil are removed, the leaves placed between blotting paper, and the book is closed. If the spots are large, and dotted with black points, tartaric acid is applied.

To Dissolve Rubber.—The best method of dissolving odds and ends of sheet india-rubber is in a mixture of methylated ether and petroleum spirit of benzoline. The general method of using up old india-rubber is by heating it with steam, under which the sulphur discharges, the rubber melts, runs into hot water, and collects at the bottom of the pit, the vapour preventing it from burning.

How to Make Metallic Writing Pencils.—These are made of an alloy of lead, bismuth, and quicksilver. The ingredients vary according to the desired degree of hardness. The ordinary proportions are: lead 70, bismuth 90, and quicksilver 8 parts by weight. A larger proportion of lead and quicksilver makes the pencil softer, and produces darker marks in writing. The lead and bismuth are melted together and allowed to cool somewhat, when the quicksilver is added, and the composition cast in proper moulds.

The Lead Pencil.—There is no real pencil lead nowadays. There was a time when a spiracle of lead, cut from the bar or sheet, sufficed to make marks on white paper, or some rougher abrading material. The name of lead pencil came from the old notion that the products of the Cumberland mines were lead, instead of being plumbago, or graphite, a carbonate of iron capable of leaving a lead-coloured mark. With the original lead pencil or slip, and with the earlier styles of the lead pencil made direct from the Cumberland mine, the wetting of the pencil was a preliminary to writing. But since it has become a manufacture the lead pencil is adapted, by numbers or letters, to each particular design. There are grades of hardness, from

the pencil which may be sharpened to a needle point, to one which makes a broad mark. Between the two extremes there are a number of gradations which cover all the conveniences of the lead pencil. These gradations are made by taking the original carbonate and grinding it, and mixing it with a fine quality of clay in differing proportions, regard being had to the use of the pencil. The mixture is thorough, the mass is squeezed through dies to form and size it, then dried, and put in its wood casing.

How to Preserve Pencil Sketches.—The pencil drawings of mechanical draughtsmen and engineers may be rendered ineffaceable by a very simple process. Slightly warm a sheet of ordinary drawing paper, then place it carefully on the surface of a solution of white resin in alcohol, leaving it there long enough to be thoroughly moistened; afterwards dry it in a current of warm air. Paper prepared in this way has a very smooth surface, and in order to fix the drawing the paper is to be simply warmed for a few minutes. This process may prove useful for the preservation of plants or designs when want of time or other cause will not allow of the draughtsman reproducing them in ink. A simpler method than the above is to brush over the back of the paper containing the charcoal or pencil sketch with a weak solution of white shellac in alcohol.

Counting Lead Pencils.—In factories where pencils are made in numbers, a simple method of counting has been devised, with a view to saving time and trouble. Strips of wood are employed, having in each 144 grooves, and the workmen, taking up a handful of pencils, rapidly rub them along the board once and back, thus filling all the grooves in which the pencils lie, similarly to pens on a rack. In five seconds a gross may thus be counted, without the least likelihood of making a mistake, and much time and labour are saved.

Translucent Pictures.—A method of making these pictures comprises the following processes: Paper pulp, white or coloured, in a liquid or semi-liquid state, is poured into a mould, usually of metal, the bottom of which is

engraved to form or produce the desired design or picture. Enough pulp must be poured in to leave a thin film of paper over the highest lines of the engraved surface, when the pulp is dried, as hereinafter described. Those portions of the engraving which correspond with the dark shades of the picture are cut deeper than those which correspond with the lights, the depth varying with the depth of the shade. Upon the paper pulp in the mould is spread a piece of gauze, fine linen, or other similar material which will not adhere to the pulp, but will permit the passage of water, and on this is placed blotting paper in one or more layers, the whole being subjected to pressure in an ordinary press. The blotting paper thus absorbs the greater portion of the water from the pulp, and the latter is pressed into all the finer lines of the engraving. For the blotting paper any other absorbent material—as some kinds of felt—may be substituted. After removing the mould from the press the blotting paper and the linen or gauze separating material are removed, and the mould containing the partially dried pulp is subjected to artificial heat, as in a stove or kiln, to dry out the remaining moisture. The dried paper pulp is now removed from the mould, and will be found to consist of a continuous perforated paper leaf bearing the design or picture, which will be fully brought out when the sheet is held up between the eye and a strong light. The thinner portions of the sheet will represent the lights of the picture, and the thicker (and less translucent) portions will represent the shades. The picture or ornament thus produced is called a "linophany," and may be employed for lamp or gas shades, for transparent pictures for windows, etc., or for any ornamental purposes to which such a picture or design is adapted. In lieu of using artificial heat to dry the pulp in the mould it may be dried by the natural evaporation of its moisture. The mould is usually engraved, but the design may be formed in any way—as by pressure from a hardened relief-plate.

A Home-made Fountain Pen.—Take two ordinary steel pens of the same pattern and insert them in the common holder. The inner pen will be the writing pen. Between this and the outer pen will be held a supply of ink, when

they are once dipped into the inkstand, which will last to write several pages of manuscript. It is not necessary that the points of the two pens should be very near together, but if the flow of ink is not rapid enough the points may be brought nearer by a small piece of thread or a minute rubber band.

Manufacture of Steel Pens.—Steel used for pens is made in sheets about two feet long by one foot three inches wide, 0·004 inch thick. They are cut into bands of different widths, according to the dimensions of the pen required. The bands are heated in an iron box and annealed, when they are passed on to the rolls and reduced to the desired thickness of the finished pen, thus being transformed into ribbons of great delicacy, about four feet long. The blanks are stamped out by a punching machine. The blanks leave the die at the lower part of the machine, and fall into a drawer with the points already formed. They are then punched with the small hole which terminates the slit, and prevents it from extending, and afterwards raised to a cherry-red heat in sheet-iron boxes. The blanks are curved between two dies, the concave one fixed and the convex brought down upon it by mechanism. The pens, now finished in form, are hardened by being plunged, hot, into oil, when they are as brittle as glass. After cleansing in a revolving barrel with sawdust, they are tempered in a hollow cylinder of sheet iron revolving over a coke fire. The cylinder is open at one end, and while it is being turned, a workman throws in several gross of pens at a time, and watches carefully the effect of the heat on the colour of the pens. When they assume a fine blue tint, he pours the pens into a large metal basin, separating them from one another, to facilitate the cooling. After this process comes the polishing, which is effected in receptacles containing a mixture of soft sand and hydrochloric acid, and made to revolve. This operation lasts twenty-four hours, and gives the pens a steel-gray tint. The end of the pen, between the hole and the point, is ground with an emery wheel, revolving very rapidly. It now remains to split the pens, which is performed by a kind of shears. The lower blade is fixed, and the upper one comes down,

with a rapid motion, slightly below the edge of the fixed blade. To give smoothness to the slit, and to make the pens bright, they are subjected to burnishing by being placed in a revolving barrel filled with boxwood sawdust.

Using New Pens.—The ink will flow freely from new pens if they are passed before using two or three times through a gas flame to remove the grease with which they are coated.

Perennial Ink-Eraser.—A fluid for removing ink from paper or parchment—in order to rectify a mistake or clean off a blot without any injury to printers' ink, or ruling upon any mill-ruled paper, and leaving the paper or parchment as clean and good to write upon as it was before the mistake or blot was made—consists of one ounce of solution of chloride of lime combined with two drops of acetic acid. The end of the penholder is dipped into the fluid, and applied to the writing without rubbing. When the ink has disappeared the fluid is taken up with a blotter.

Printed Stained Glass.—Something pretty to look upon is now produced abundantly by printing-presses. The imitation stained glass now so frequently seen is the product of the hand printing-presses. Blocks of wood are used to convey the impression desired; these blocks are inked with oil colours specially mixed for the purpose. Sheets of thin, porous, handmade paper are used, prolonged impressions being given, so that the oil colours will thoroughly permeate the paper; a separate impression is made for each colour. The design desired having been printed on as many sheets as are required to complete the pattern, which may be as large as a cathedral window if required, the sheets are soaked in warm water for half an hour, sponged off on being taken out, and coated on one side with a thin cement. A similar coat of cement is applied to the glass on which the printed paper is to be placed, the paper is laid over this, and the back varnished over. The glass thus becomes, to all appearances, stained glass. The effects of lead lines of irregular curves and fragments of coloured glass in mosaic

are reproduced with as great brilliancy and as fine artistic effect as in genuine glass. Time and changes of temperature exercise no ill effects on the printed stained glass, which is frequently mistaken for the real and far more costly article.

Cultivating a Speciality.—All good work, if it is the best of its kind, has come of late years from men who have made specialities of a particular kind of effort. Of printing this is as true as of any other art, and but seldom does an office succeed in doing all kinds of work well. It is a theory that one office, or one head man of an office, should work exclusively on hand-presses, another on job-presses, a third on registered colour work, and another on high-class black and white, or single-colour work. Of course this is impracticable just now; but it is as certain to come in time as a distinguishing characteristic of all great offices as it is true that the indications unquestionably point that way even now.

Does Fine Printing Pay?—This question is often asked, and the number of offices is steadily increasing where it will be answered in the affirmative. It is a fact not to be disputed that the taste of business men in this direction has been educated up to a point where they can and do appreciate first-class work. They recognize, too, the value of an attractive card or circular to their business. The object of such things is to attract attention, and if they are artistically designed and finely executed they will accomplish the purpose for which they are sent out. The majority of business men whose trade is worth having will pay for a good job. Improve the quality of the work and charge a fair price for it, and the chances of success will be greater than in doing poor work.

Too much Hurry.—Many a job is spoiled by rushing it through when near completion. Time and care are given to it by the compositor and proof reader, but the pressman is urged to rush it through to get it out in time. The result is that a smutty, blurred, dirty job is turned out, and the whole effect of good composition, good paper, and good ink is ruined. If a job must be rushed through, get the time

from somewhere else and let the press work be decent. The most skilful efforts of the compositor are nothing but daubs when the press work is hurried through, while the most ordinary specimen of composition shows up in good shape with nice clean press work.

Steam Pipe for Heating.—The following rule is for finding the superficial feet of steam pipe required to heat any building with steam: One superficial foot of steam pipe to six superficial feet of glass in the windows, or one superficial foot of steam pipe for every hundred square feet of wall, roof, or ceiling, or one square foot of steam pipe to eighty cubic feet of space. One cubic foot of boiler is required for every 1,500 cubic feet of space to be warmed. One horse-power boiler is sufficient for 40,000 cubic feet of space. Five cubic feet of steam, at seventy-five pounds pressure to the square inch, weigh one pound avoirdupois.

Preventing Explosion of Boilers.—A device consists of a plate or cover held on a packing surrounding the outlet steam pipe, a weighted rod or stem holding the cover or plate on the packing, while a stop prevents the plate or cover seating itself on the outlet pipe after the packing is removed or thrown out by the pressure of steam from the boiler.

Cost and Selling.—To the items of paper, composition, proof reading, press work, etc., add for rent and expenses, and interest upon investment in type, presses, etc., upon each job done, 20 per cent. This will give about the *dead cost*. If one wants a profit and to cover contingencies, add at least one-third to the total; in most cases one-half is a safer plan.

Cost of Printing.—It is a common practice of printers, in calculating cost of printing, almost to disregard a long list of smaller items, largely affecting total cost. The following list will open a question whether the average run of job and book printing does not require a margin of over 25 per cent. beyond the three leading lines of paper, composition, and press work, before actual cost of producing the work

is got at: Overseership, reading, inks, rollers, power (including coal, water, gas, and attendants' time), lighting, spoiled work, errors on wrong side in estimates, losses in slack times, bookkeeping and correspondence, time consumed in taking orders, warehousing (including giving out and cutting papers, packing, etc.), messengers and cartage, bad debts, wear and tear of plant, depreciation in value of plant —even if never used, caused by improvements in machinery, repairs of actual breakages, etc., not included in an ordinary wear and tear average—rent of premises (often affected by additions done by tenant), insurance of plant, taxes.

Good Light.—There are few mechanical occupations where the need of good light is so imperative as in a printing office. There are so many small details to be seen to, whether it be in composition or press work. Defective light of any kind greatly impairs the efficiency of every man compelled to labour in it. In this respect, it is very poor economy to locate a printing office in a room or rooms where the amplest light cannot be obtained, or to use a poor light. The best of oils and gas are poor substitutes for daylight, and besides, they cost more money. Too vivid a light can be shut off by screens or curtains; but none of us can evoke the sunshine at will, or lengthen the day at either end. The continual burning of gas all day, as observed in some printing offices, is wasteful indeed, and the extra expense it entails, directly or indirectly, would go a good way towards paying a higher rent for better lighted quarters.

Colour Blindness.—This is much more common among printers than is generally supposed, if one is permitted to judge from jobs sent out. During the holiday season especially, one is flooded with abominations of tint and taste, with miserable chromos and calendars which are a disgrace to the art. When will craftsmen learn to avoid the delusions and pitfalls of colour, and assert the strict taste embodied in black and white? Zebra-striped and rainbow-illuminated monstrosities will ever be a plague. Printing gains nothing and loses much from such violations of established rules, which in many instances proclaim the

perpetrator to be afflicted with distorted vision and colour blindness. We do not refer to the product of the true artist, which is always pleasing, but to the efforts of those who invariably go beyond their depths.

Protection of Eyes in Proof Reading.—A piece of fine green glass laid on the proof is a relief to the eyesight.

Composition of Coloured Pencils.—The first four grades are as follows:

	No. 1. Very soft.	No. 2. Soft.	No. 3. Hard.	No. 4. Very hard.
Aniline...	50 parts.	46 parts.	30 parts.	25 parts.
Graphite	37·5 ,,	34 ,,	30 ,,	25 ,,
Kaolin ...	12·5 ,,	24 ,,	50 ,,	50 ,,

For purple an aniline violet is used; for other colours various shades of aniline. The cheaper qualities of coloured pencils consist simply of the colouring material mixed with kaolin or clay.

How Common Crayons are Made.—The process of manufacture of the common chalk or school crayon consists of mixing equal parts of washed pipeclay and washed chalk into a paste with sweet ale made hot, into which a chip or two of isinglass has been dissolved. This paste is rolled out with a rolling pin, cut into slips, then rolled into cylinders by means of a small piece of flat wood, cut into lengths, and finally placed in a slow oven or drying stove until hard.

Composition for Crayons.—A newly patented composition consists of: Water, 8 lb.; kaolin, 15 lb.; wheat-flour, 1 lb.; soapstone, 1 lb.; Paris white, 45 lb. A thick paste is made of flour and water, which is dissolved in 8 lb. of warm water, the other ingredients being thoroughly mixed therein by agitation. The water is pressed out of this composition, which is squeezed through dies of suitable shape. The crayons harden by exposure to the air. This composition makes a crayon which does not require heat to harden, is free from dust, white in colour, and, by varying the proportions, can be made in colours by colouring the water.

To Prevent Scaling of Boilers.—The gum of the eucalyptus globulus, it is said, has the effect of thoroughly removing the scales which form on boilers and preventing rust and pitting. The effect of this preparation will, it is expected, extend the period of the usefulness of boilers 100 or 150 per cent., and at the same time ensure a very considerable saving in fuel, as scale is a non-conductor of heat.

Boiler Incrustation.—One of the most serious annoyances which printers who use steam extensively have to encounter is the incrustation which always goes on within the boiler, at a rate depending mainly upon the amount of lime with which the water is impregnated. In some districts this is so great that natural springs and wells will speedily convert sticks, or leaves, or any other objects which may drop into them, into what are popularly called petrifactions, the objects, whatever they may be, being apparently converted into stone. This petrifaction of the inside of a boiler not only seriously reduces the working power of an engine, but is a prolific source of explosions, and is at all times a source of anxiety and expense.

Maxims for Printers.

It is better to remain idle than to work at a loss.

Genius is as rare in printing as in any other art.

Legitimate competition is a sign of life and health.

Do all work carefully, striving for constant improvement.

Follow copy, provided it is good, and never copy anything bad.

A printer cannot be successful if the imprint of care and study is not upon his brain and hands.

Preserve all specimens of good work that come into your possession, and spend your leisure time in their study.

Unless an apprentice is possessed of an ambition and determination to excel, the chances are that he will always be but a poor workman.

Skill in business, a well-earned reputation for uniformly superior work, a good financial credit, promptness, honourable and liberal dealing, correct and steady personal and business habits, are absolutely necessary concomitants of success.

No matter how good a printer may be, he will learn something new every day; and in every job done for a customer, study how to improve upon it next time. Never let a poor or carelessly executed job go out of the office, no matter even if, by mistake in "estimating," or for any other reason, money be lost on this particular one.

Study the work of first-class printers. A skilful workman has expended time, thought, and labour in its production.

It is not the grace or beauty of a single line which produces the result sought. The specimen must be judged as a whole.

Never curve a line where it would look better straight.

Do not crowd a job to put in a flourish or ornament.

Elaborate borders can only be used effectively by first-class workmen.

A plain rule border, with a neat corner, is more effective than a display border on a small card.

Ornament has to be kept strictly within the stern chasteness of taste, and permits of no extravagance of detail.

Ornament should always be subservient to its proper use. Any superfluity or preponderance destroys the proper effect.

It is better to do a good, plain job in black ink and one style of type than to use an outrageous combination of fantastic ornaments in the glowing hues of the rainbow.

The use of ornaments requires a cultivated taste. They were intended to light up, not smother; to give an airy grace, not detract; to do away with monotony, not make a dreary waste.

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